RAILROAD GAZETTE

FRIDAY, OCTOBER 25, 1901.

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Contributions

Derailers.

Locomotive Appliance Co.,
Chicago, Oct. 16, 1901.

To the Editor of the Railroad Gazette.

In the article in your paper of Oct. 11, under the caption of "The Derailer; Its Past, Present and Possible Future," the writer must have unintentionally made reference as he did to the Smyth Derailer, for I feel sure that Mr. Wileman would not intentionally misstate a fact. In speaking of a certain derailer he continues by saying, "The Smyth is made on the same principle but is about 3 ft. long, guiding the wheel flange upward and outward, less suddenly"; and continuing mentions another derailer and then states, "These forms are only intended for use in close quarters where there is not room for a regular point; nor are they entirely reliable for heavy work, as instances are known where the leading truck of a heavy engine has passed straight over the block, without the slightest deflection."

In this quotation is the erroneous statement as to the Smyth derailer, which is not injured should the heaviest locomotive pass over it, entering upon the rear end; nor would the locomotive be derailed under such conditions. On the other hand, should the heaviest locomotive approach the Smyth from its "business" end the locomotive will *surely* be derailed and *no* "instances are known where the leading truck of a heavy engine has passed straight over the block without the slightest deflection." The Smyth is a sure and positive derailer, when placed in position. It meets all the requirements summarized by Mr. Wileman, as well as fulfilling the demands of the Indiana law to which reference is made.

Will you kindly accord this correction a place in your valued paper. IRA C. HUBBELL, *President.*

The Brooklyn Bridge—Its Defects and Treatment.

New York, Oct. 22, 1901.

To the Editor of the Railroad Gazette.

The suggestion having been made in your number of Oct. 18, that the whole superstructure of Brooklyn Bridge, with the exception of cables, be replaced by a new one without stays and with stiffening trusses about 10 ft. deep, we wish to state the reason why such a radical solution of the problem seems much less advisable to us than the one we recommended.

The proposition has the merit of simplicity and we concede that simplicity is extremely desirable. We believe the most desirable suspension bridge to be composed of two groups of cables and two stiffening trusses, three-hinged if deep, and continuous at center if shallow. Also that economy, stiffness under *train loads* and the agreement of the structure's action with the assumptions of the calculations will all generally lead to the selection of deep trusses. If there are two long shore spans supported from cables, anchored bents near center of shore spans become the most economical and effective means for reducing the changes in deflections if either main or shore spans are preponderantly loaded.

We suggested only such changes in the present bridge as are necessary to make it as safe as the best class of modern railroad bridges. We found the stiffening trusses, as far as we investigated them, entirely safe except at stay system. We, therefore, proposed to make only such changes in them as would prevent deterioration, and proposed to repair and strengthen them where both experience and calculation have shown them to be weak. We proposed to replace the suspenders in center by others of entirely different design. We found the floor and end connections of stays and suspenders defective and suggested their strengthening. We suggested modifications in cables to remove secondary stresses, some new stays and the addition of an anchored bent below each shore span to reduce bending stresses in towers and changes in deflections of main and shore spans. We also suggested some changes in saddles to make them movable. We proposed to remove the suspenders over the larger part of distance from towers to ends of stay system, and to carry the whole load near towers by stays, thereby so relieving cables as to enable them and the anchorages to carry the increased dead and moving loads coming on improved bridge.

By means of these changes and perhaps a few others suggested by more minute study of the bridge it can be so strengthened as to be safe not only for present but for much increased traffic.

Three aims were before us in our recommendations. The changes should, if possible, be made without interfering with traffic; they should increase the capacity of the bridge and they should not be more expensive than necessary to produce a perfectly safe bridge under the increased loads. All these aims can be attained by our method.

We believe that the changes suggested by our critic could not be made without serious, long-continued interruption of traffic; they would, as conceded by him, not increase the capacity of the bridge. They would be unnecessarily expensive, and would create a type of bridge so flexible that every passing train would produce a great traveling wave of deflection over the whole bridge.

At present the four main stiffening trusses are 17 ft. high and they have to reduce local deflections in a 740-ft. span between ends of stay system. Our critic proposes removal of stay system, while we propose to strengthen it. His proposed 10-ft. deep stiffening trusses would, therefore, have to stiffen a span 1,550 ft. clear.

His stiffening trusses would be practically only floor stiffeners and would reduce the changes in deflections of unstiffened cables by only about one-eighth. The excessive flexibility of the bridge he proposes would not be dangerous, but it would, in our opinion, seriously impair the confidence of the public in its strength and safety. To judge whether the objections based on the lack of stiffness of the proposed bridge are well founded it is necessary to calculate the amount of deformation produced by the moving loads.

Any radical and expensive repair of the bridge should provide for at least five-car trains at a minimum time interval of 45 seconds. These may be on one, two or all three spans. It should also provide for trolley cars at a space interval of two car lengths, center to center of cars, for 750 lbs. per lineal foot of bridge on the promenade, and for 500 lbs. per lineal foot of bridge on the two wagon ways. In case of accident on one roadway the load of its trolley cars may extend over only one end span or over main span and one end span. There may, therefore, be a load of 1,600 lbs. per lineal foot of bridge moving like a railway load, while the remaining moving load will be about uniformly distributed over the whole length of bridge, and its distorting effect may be neglected.

The cables may be either fixed on towers or moving freely on saddles. If the former, an increase of moving loads over present ones would increase the already too large bending stresses in towers. This arrangement is, therefore, objectionable.

If the saddles move freely, then the above assumed moving load would, with 10-ft. stiffening trusses, produce changes of deflection of 8.94 ft. on center line of bridge in center of main span and 9.25 ft. on center line of bridge in center of shore span, if stiffening trusses are made of the same weight as the present ones. What is worse is that these deflections would be very different on the four cables, giving the floor beams a strong slant towards either north or south. The trains alone would produce by their motion average deflections about one-half as large and of frequent occurrence. The present four-car trains would frequently produce deflections of over four-tenths the above amounts.

To the deflections above given would have to be added the deflection of about 4 ft. in center of main span due to changes of temperature. The mean position of roadway would, therefore, have to be several feet higher at center of bridge so as not to interfere with the prescribed clearance for navigation at lowest position of bridge. This would increase the already objectionably steep grades of railroads and roadways.

We, therefore, believe that the design proposed by our critic can not be made as strong as is desirable, is too flexible to inspire confidence, gives too heavy grades, cannot be built without serious interference with traffic, and is unnecessarily expensive.

Any moderate increase in the depth of 10 ft. suggested for stiffening trusses would produce no material increase in stiffness. With the stay system removed, we believe that from 30 to 40 ft. depth of stiffening trusses would be required to give the degree of stiffness to the bridge which is desirable if it is used by trains.

JOSEPH MAYER,
EDWIN DURYEA, JR.

Superintendents of Bridges and Buildings.

The eleventh annual meeting of the Association of Superintendents of Bridges and Buildings was held at the Kimball House, Atlanta, Ga., commencing Tuesday morning, Oct. 15. The meeting adjourned the following Thursday, after selecting Minneapolis, Minn., as the place of the next meeting, to be held the third Thursday in October, 1902, and electing the following officers:

Officers for Ensuing Year.—President, W. S. Danes, Wabash Railroad; First Vice-President, B. F. Pickering, Boston & Maine; Second Vice-President, A. Shane Toledo, St. Louis & Western; Third Vice-President, A. Zimmerman, Colorado & Southern; Fourth Vice-President, C. C. Mallard, Southern Pacific; Secretary, S. F. Patterson, Boston & Maine; and Treasurer, N. W. Thompson, Pittsburgh, Fort Wayne & Chicago. The members of the Executive Committee are: A. Montzheimer, Chicago & North Western; W. E. Smith, Louisville & Nashville; A. W. Merrick, Chicago & North Western; C. P. Austin, Boston & Maine; C. A. Litchty, Chicago & North Western, and W. O. Eggleston, Erie R.R.

A. D. Candler, Governor of Georgia, made an address of welcome. Thirty members responded to roll call. The names of 36 applicants for membership were read and these were elected to membership. President W. A. Rogers, in his opening address, said in part:

The Association of Railroad Superintendents of Bridges and Buildings has passed the experimental stage. It has taken its place as one of the strongest and best of the railroad technical societies. Its published proceedings are among the best of their class, and are highly prized by technical men. To be a member of this association is considered a privilege, and is evidence of a desire to be progressive. . . .

We must keep up the interest of our conventions by varying the programmes. There is always the danger of getting into a rut. Papers on well selected subjects or descriptions of work done are very interesting and valuable. Descriptions of particular jobs, even though they may not be out of the ordinary, are instructive, in that they show individual methods. Our committee reports are a very important feature of our conventions, and the information collected by the members is invaluable. Many of them in their printed form are referred to constantly by those interested, and others contain information that cannot be obtained from any other source. The speaker has thought that it might seem best to occasionally appoint a committee to carry on a line of experiments to throw light on important features of our work. It might be of value for us to go into the question of specifications for different classes of work or materials that we use. The idea that the speaker wishes to convey is that we should guard against sameness in our programmes and work. A lecture by an outsider on some subject of interest to us, especially if the lecturer be an expert in his line, might be a pleasant variation. Let us, however, confine ourselves, both in selecting subjects for committee reports, papers, etc., carefully to that which belongs strictly to the bridge and building department.

The Secretary reported that the present membership is 168.

The reports printed in our last issue were presented by abstract at the Tuesday afternoon session. Reports on "Methods of Sinking Foundations for Bridge Piers;" "Slips for Ferryboats for Transferring Railroad Cars," and "Auxiliary Coaling Stations" were not ready in time for presentation at the meeting, but one or more of these reports will be printed in the proceedings.

Sinking Foundations for Bridge Piers.—There was a brief discussion of "Methods of Sinking Foundations for Bridge Piers in Water 20 ft. Deep and Under," although no report was presented. Evidently the method of driving one or more rows of sheet piling to form a coffer dam is the one in most common use. J. M. Staten, Chesapeake & Ohio, described a method of forming a coffer dam where the bottom of the stream was rock and sheet piling could not be driven. The water was about 6 ft. deep. Sacks were filled with dirt and clay and were then piled one upon another to form a wall. This was said to make a good coffer dam under the conditions.

A member described a method of depositing concrete under water where a coffer dam could not be built which was thought to be better than putting the concrete in bags and then sinking the bags to position. With this latter method the cement is liable to be washed out, resulting in poor concrete. The plan described makes use of a long water-tight box, open at the bottom but kept full of concrete at all times. The box extends from the bottom of the foundation to a suitable distance above the water. The concrete is mixed dry and, as the box is kept full of concrete, no water reaches the concrete until it is placed at the bottom of the stream. The concrete is distributed on the foundation by moving the bottom of the box back and forth. This is a continuous process.

Where the bottom consists of gravel and boulders the water often enters the coffer dam from below faster than it can be pumped out. A member overcame this difficulty by filling the coffer dam with water until the level inside was slightly higher than that outside the dam. Then concrete was deposited on the bottom inside the coffer dam and allowed to set. The water was then easily pumped out and the rest of the concrete was placed in the usual way.

Passenger Platforms at Way Stations.—The desire now is to get a better and more permanent platform than can be made with timber. Mr. J. B. Sheldon, New York, New Haven & Hartford, said that the committee had

found that the most economical platform was that made of coal tar composition, and this platform was highly recommended. The hardness of the composition can be varied by increasing the proportion of sand, but the composition having the largest proportion of pitch lasts longest.

Mr. A. S. Markley, Chicago & Eastern Illinois, said that platforms of cinders or fine stone screenings were unsatisfactory, as the cinders or screenings were tracked into stations and coaches. He is now paving the old cinder platforms with brick, using the old platforms as a foundation. Concrete curbing is used in this work, costing 10 cents a lineal foot. The curbing is all made at Danville, Ill., and shipped to points where it is to be used. This is said to be much cheaper than making the curbing on the ground.

H. Rettinghouse, Chicago & North Western, is making platforms of cinder concrete. For this purpose clinkers from the locomotive ash pans are best; front end cinders being of no use. The cost of these platforms has been reduced to between 2 and 3 cents a sq. ft. This cost includes all labor, concrete used and the cost for loading cinders, but no freight charges.

Operating Turntables by Power.—Walter G. Berg, Lehigh Valley, outlined in a general way the conditions under which different forms of motors could be used to the best advantage for driving turntables. In his opinion the use of very heavy locomotives and the heavy business now being done and in sight made it economical to drive turntables by power. While there was no doubt about this point, opinion as to the exact form of motor to be used under different conditions may change somewhat after a few years' experience.

As to the question of maintenance and repairs any shopman can easily learn to operate either an electric or gasoline-driven turntable. The use of electricity presumes that a power station is in the vicinity so that any repairs to the electrical apparatus requiring expert knowledge can quickly be made by electricians from the power house. Any of the machinists about railroad shops can repair gasoline engines, so there is nothing prohibitive on the score of maintaining either form of rigging.

If an electric drive is used it presumes an electric plant in the vicinity, but Mr. Berg said it will not be found economical to operate turntables by electric motors if men must be kept in the power station at night and on Sundays for that purpose only. Unless the power station is operated at all times for other reasons, the use of electric motors for turntables is questioned. Where current is not available at all times, and at points distant from power stations, the gasoline engine is preferred. It comes next to the electric motor in order of desirability. If for any reason a gasoline rigging is no longer needed at a given point, due to shop changes and the extensive use of electricity, it can easily be transferred to some isolated point so that the original investment in the gasoline apparatus is not lost.

Mr. Berg called attention to the report in that nothing was said about air-driven turntables. As a possible objection to air he mentioned the trouble experienced from air pipes freezing in cold weather. The Union Pacific is using an air system on some of its turntables in which the air to drive the table is furnished from the locomotive being turned. This system is reported to work fairly well, but it is not recommended by the Union Pacific for points where a great many engines are turned, or where many dead engines or many passenger cars are turned. An air reservoir is mounted on the table which forms a small reserve for such cases.

Mr. Berg has received information from the New York Central to the effect that it has had no trouble from snow and ice in operating gasoline-driven turntables. As snow troubles do not involve the question of the motor, but rather the friction between the driving wheel and the rail, he assumes that this statement applies as well to electrical-driven tables as to gasoline riggings.

Mr. A. S. Markley suggested that a storage battery might be used to furnish current for the turntable when the power station was not run. He has used a storage battery in connection with an electrically-driven drawbridge. Current is supplied by a generator driven by a 40-h.p. gasoline engine. Since the storage battery was installed, there has been a saving of 10 gals. of gasoline a day, which was previously required to run the generator for the bridge alone.

Mr. W. O. Eggleston, Chicago & Erie, said the Erie was using steam engines for driving turntables. One steam rigging now being installed was made of old materials and steam would be taken from the roundhouse boilers. The conclusion was that this rigging cost practically nothing for first cost or for power.

Mr. Berg said he had received information from the Erie to the effect that steam-driven turntables using a boiler and engine were more economical than electric-driven tables. He questioned the correctness of this conclusion, as it is not reasonable. The power costs something, no matter how obtained. Then with the steam plant, the coal and ashes have to be handled; in cities, a licensed engineer must be employed and the repairs to the steam plant must exceed the repairs to a gasoline engine. He thought Mr. Eggleston's statement was an example of the common careless way in which railroad costs were estimated.

Mr. Markley said he had a steam-driven drawbridge which was a nuisance. Mr. Schall, chairman of the committee, added that he thought steam apparatus was so out-of-date for turntables that he failed to bring plans of an old design of steam apparatus used by the Pennsylvania R. R. The discussion was concluded with the understanding that all members would collect information as to the cost of power-driven turntables and present it at the next meeting.

Water Stations.—There was a general discussion of the probable life of steel water tanks, but little definite information was brought out. Mr. C. M. Large, Erie & Pittsburgh, told of an oil tank which was used for oil for 22 years, and then used as a water tank 12 years before it had to be replaced. He thought with good water steel tanks would last from 35 to 40 years. Mr. C. A. Litchty, Chicago & North Western, pointed out that the kind of water had much to do with the life of steel tanks. In one place on his division ¼-in. pipe is destroyed in from four to five years. Mr. C. Carr, Michigan Central, said that their track tanks, made of $^3/_{16}$-in. steel plates last only three or four years. The water is considered good. The sheets are first pitted and then cracks open and the tanks have to be patched.

Mr. W. M. Clark, Pittsburgh & Western, said the tile water tank built as an experiment on the Pittsburgh & Western about two years ago was so far a perfect success. The capacity is 100,000 gals. None of the tile has broken and no repairs have been required of any kind.

Erecting Steel Structures.—Mr. Riney, Chicago & North Western, said he could not agree with the committee's conclusion that railroads should do their own erecting unless roads were fully equipped for the work, and they seldom are. The contractor is organized and equipped to do erection all the time, while most roads have so little erecting to do that their men are not experienced and have not the necessary tools. It was thought that one reason why work could be done faster by a contractor was that the men stayed on the work until it was finished. The railroad's men lost considerable time traveling to and from home. His opinion was that the work cost less when done by contract.

Mr. Berg regretted that the report showed on its face that it was not impartial. He thought the conclusion that railroads should do erection work was theoretically correct but practically it is not a correct conclusion in all cases. Few roads have enough work to warrant organizing a first-class bridge gang and having a first-class erector and keeping the necessary equipment on hand. The Lehigh Valley, after trying both ways, has reached a compromise by letting all its large jobs of erection to contractors. Unless a road has much erection work for the future, Mr. Berg thought it was best to use contractors for large jobs.

Mr. J. Stannard said the Wabash erects all its steel bridges and considers it is cheaper and more satisfactory than to use contractors. The road's men have to put in and maintain false work and put on the floor and track in any case and he thought they may as well do the entire job. Last year 12 large steel bridges were erected in this way on the Wabash.

Mr. Staten, Chesapeake & Ohio, said it was a mistake to suppose the contractor's men were always experienced. So far as his observation went, contractors organized their gangs in the neighborhood of the work and further they employed any one they could get, and often men the road would not hire. His experience with contractors had been unsatisfactory.

Mr. J. McIntyre, Erie R. R., said it was not necessary to keep a large force to do erection if the work was done by railroads. Three or four experienced men only were needed in the gang and the rest could well be extra men.

No attempt was made to reconcile these differences of opinion.

Outfit Cars for Bridge Gangs.—The discussion showed that the practice of providing bridge gangs with tool and boarding cars was quite common. The difficulty in getting men in some localities makes it necessary to fit these cars so the men can live cheaply and at the same time be comfortable. The Boston & Maine and a few other roads employ a man to do the cooking, but this does not appear to be a common practice. Usually this is done by one of the regular men.

The other topics on the programme were not reached for discussion, and there was not time to again discuss the reports of last year.

On Wednesday afternoon the Georgia R. R. furnished a special train for a trip to the large granite quarries on Stone Mountain. On the way stops were made at various manufacturing plants and cotton factories. A party of those in attendance at the convention left Thursday night for an excursion to Miami, Fla.

The following are the subjects for reports at the next meeting:

SUBJECTS FOR NEXT YEAR'S REPORTS.

The following list of subjects are for report at the next meeting:

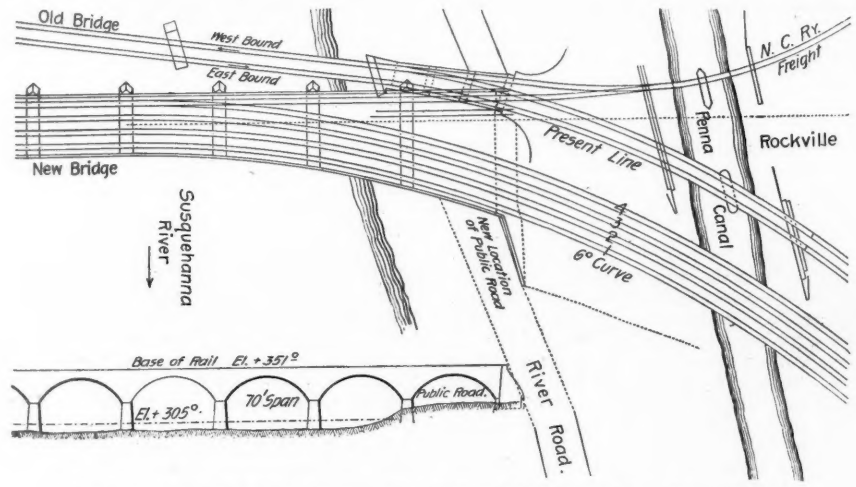
1. Auxiliary coaling stations; best design, capacity and method of handling coal.
2. Roof coverings; first cost, life, efficiency and maintenance expenses for various classes of railroad buildings.
3. Mail cranes; first cost, efficiency and maintenance of various styles in use.
4. Best method of protecting low overhead structures from gases from locomotives.
5. Experience in the use of concrete under bridge bed plates and turntables in place of pedestal stones. What is the best form and material for bed plates under various styles of iron bridges?
6. Best design and recent practice in building railroad track pile drivers.
7. Best materials and design for roundhouse pits, including drainage and rail fastenings.
8. Best materials for wearing surfaces of roadway of highway bridge floors.

Representatives of the following companies attended this meeting: Chicago Pneumatic Tool Co.; F. W. Bird & Son; Joseph Dixon Crucible Co.; Fairbanks, Morse & Co.; the John N. Poage Mfg. Co.; the Protectus Co., and the Sherwin-Williams Co.

The Rockville Bridge of the Pennsylvania.*

BY C. W. HARDT, C. E.

The Rockville bridge is fast nearing completion, and by November it will be finished, and the Pennsylvania Railroad will have a stone arch bridge unlike any other in the world, as it is the only one of its length carrying a railroad. Upon this structure four trains can run at speed at the same time. The bridge is an imposing work, its graceful arches rising above the broad Susquehanna, adding greatly to the scenery at this point.



The Rockville End of the Pennsylvania Railroad Bridge over the Susquehanna.

The construction was let to two contractors, the Drake & Stratton Company, having the east and Mr. H. S. Kerbaugh the west end. The plans were made under the direction of Chief Engineer William H. Brown by Mr. H. S. Righter, and the construction work is under the supervision of Mr. George Nauman. The first stone was laid May 1, 1900, and it was then expected that two years would be consumed in finishing the bridge, but a year and a half will see the completion of the job.

The necessity for a new bridge has long been felt, as the old iron bridge, built in 1874, was not sufficiently strong to carry the heavy modern locomotives; it had but two tracks and so was inadequate for the increasing traffic, and repairs were constantly made.

The new bridge contains 100,000 cu. yds. of masonry, and when completed will cost in the neighborhood of $1,000,000. On the west end it is 500 ft. lower down the stream than the center of the old bridge and 40 ft. on the east end. It runs at right angles to the current, while the old bridge runs diagonally across the river. The length between the abutments along the springing line is 3,791 ft.; 48 spans of 70 ft. each, 42 piers 8 ft. wide, and 5 abutment piers of 19 ft. each. The width on top between outside coping is 52 ft.

The bridge is composed, strictly speaking, of six complete bridges, divided by the abutments on each end and six abutment piers, every eighth pier being an abutment pier with a width over twice as great as the ordinary ones. This allows eight spans to be built at once, the large pier sustaining the great pressure due to the weight of the arches. In case of damage by flood to one or more spans the weight of the remaining arches would have a tendency to push over the small piers, thus the necessity of abutment piers. There was no difficulty in

*For an earlier description see the *Railroad Gazette*, May 25, 1900, page 338.

getting a good foundation for the piers. During low water one can see rocks above the surface in many places. On the west side it was necessary to blast out the rock to allow the stone work to be started below the surface of the water.

Coffer dams were sunk for each pier, puddled with clay found nearby, the water pumped out and the shallow layer of gravel, varying from 2 to 4 ft., removed. The foundation was then brought to the proper height with concrete made in the proportion of six parts of stone, three of sand and one of hydraulic Portland cement, and the neat stone work laid on top. The outside of the piers consists of ashlar, while the backing is of concrete. No grouting was done on the bridge as is usually the case, its place being taken by concrete. A narrow gage track extending out into the river, about 15 ft. above the water, was used for hauling out all material. The stone used in this bridge is a white sandstone commonly found near the bituminous coal regions and was quarried in Pennsylvania, mostly in the counties of Clearfield, Cambria, Beaver, Indiana and Westmoreland. To produce sufficient stone for this structure many new quarries were opened and hundreds of men put in to keep the work moving.

The piers are built of 24-in. stone, while the spandrel walls consist of 22, 20 and 18-in. stone. Derrick boats were used in building the piers, although at times the water got so low that they were handled with difficulty. Altogether it was a most fortunate year for bridge building, as there were no floods, the water being lower than for many years.

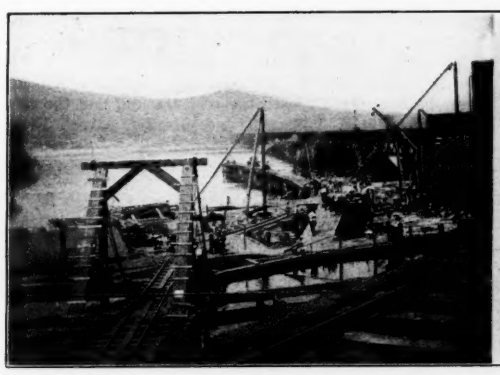
The centers upon which the arches were built were made of 4-in. yellow pine, bolted together with ¾-in. bolts and the joints strengthened with iron straps and gusset plates. About 2,300 lbs. of iron was used in each center, making the total weight about 7 tons. The thickness of the centers is 12 in. They were placed 3 ft. apart, resting on 12-in. x 12-in. sills supported by piles driven along the side of each pier. After the piers were finished the centers were placed for eight spans for one-half the width of the bridge; upon these were built a narrow gage track for hauling out stone, sand and cement, and also a traveler truck with a gage of 20 ft.; the traveler consists of a derrick with boiler and engine upon wheels so that it can be moved at will. Each contractor used these travelers and with them all the stone in the arches was laid.

The spandrel walls above the piers and the top of the arches are filled with concrete. This is made in a mechanical mixer, on shore, and put in at night, thus not interfering with the work of the stonemasons in day time. After eight spans were built for one-half the width of the bridge the centers were moved over and the other half built, and so on until the last arch was keyed on Sept. 19.

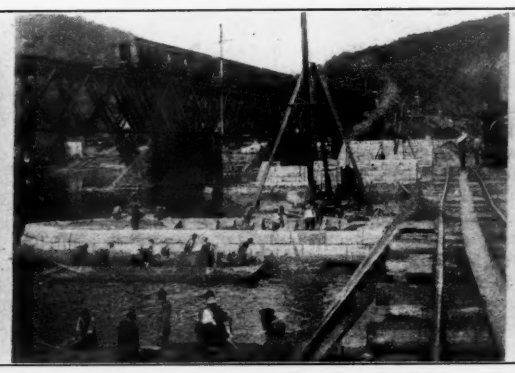
The bridge is level and straight except for four spans on each end, the east side having a 6 deg. and the west a 5 deg. curve. In the center of the bridge a 17-in. stone wall supports a wooden conduit in which will be placed cables for the telegraph wires.

The top of the arches is to be covered with concrete made of fine screenings, and upon this asphalt will be laid, giving a smooth and water tight surface. Drainage is provided in the shape of two 6-in. cast-iron pipes over each pier. After the masonry is finished the spandrel walls will be filled in with cinders, and upon this the track will be laid, ballasted with limestone, giving a solid and easy riding roadbed.

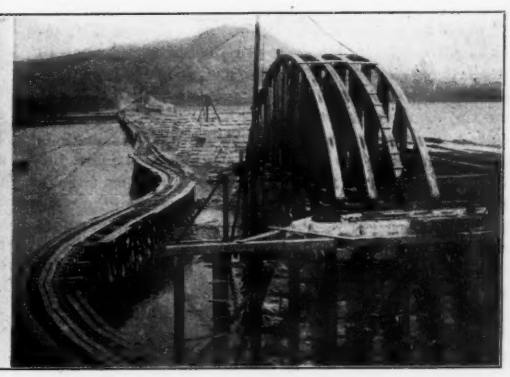
Before winter sets in the bridge will be ready for use, but no trains will run over it till next summer, owing to the extensive changes being made through Marysville, where there is yet a great amount of work to be done.



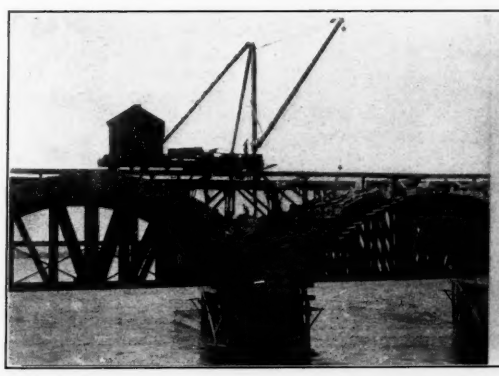
East End—Showing Beginning of Work, Lift Bridge Over Canal, Concrete Mixer and Trestle.



Construction of Piers at the East End.

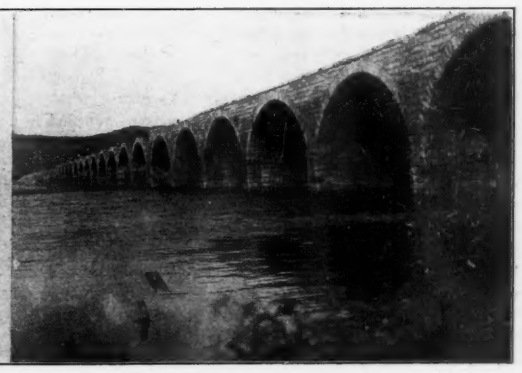


Putting Up Centers—West End.



Traveler and Centers—East End.

Middle of Bridge, Showing Old Bridge in Background.



Spans at East End of Bridge.

The Rockville Bridge of the Pennsylvania Railroad.

The Campaign Against the Scalpers.

At the recent meeting of the American Association of General Passenger and Ticket Agents in Asheville, N. C., the following report was presented by the Committee on Anti-Scalping Legislation. Of this committee Mr. Daniels is Chairman. The other members are Messrs. Turk, Wood, Townsend, Weeks, Martin, Nicholson, Farmer, MacLeod, Richardson and Pratt.

Considerable progress has been made during the year in the way of restraining ticket scalpers from handling the passenger traffic of the lines, members of this Association, although we regret to say that not as much has been done as we hoped at the beginning of the year we might accomplish. Numerous proceedings for forgery have been instituted against scalpers, notably in Buffalo, Chicago and St. Louis.

In Chicago, on Oct. 26, 1900, Gilbert E. Meiers and J. H. Jones were arrested. Nov. 2 the evidence against them was presented to the Cook County Grand Jury and an indictment found. The case was set for Nov. 27, 1900. When called on that date, the defendants pleaded guilty and were sentenced to hard labor in the penitentiary until released by the Board of Pardons. This means imprisonment for a term of from one to 14 years.

March 5, 1901, W. A. Steinborn and James Adler were arrested at Chicago for forgery of railroad passes. These scalpers were duly indicted and held to the Criminal Court in heavy bonds for trial this month. There is no doubt of their conviction.

In New York a scalper named Charles Weil was arrested. He was brought before Judge Gildersleeve in Special Term of Supreme Court, May 27, 1901, on writ of habeas corpus. After argument and submission of briefs the Justice decided the law to be unconstitutional, releasing Weil.

In Buffalo, one Clarence Fleischman was arrested charged with violation of the law by selling tickets, and was held for the Grand Jury. A writ of habeas corpus was obtained and Fleischman was released upon order of a Justice of the Supreme Court, June 5, 1901. Appeal was taken to the Appellate Division, which supported the former decision. Further appeal was made to the higher courts, and it is confidently expected that these decisions will be reversed, as they were to a great extent based on the Tyroler case, which was prosecuted under the act of 1897 and that act was declared unconstitutional mainly because it made exceptions in favor of one class. This portion of the act was entirely eliminated from the new law, and no exceptions are made under it.

July 30, 1901, the Delaware, Lackawanna & Western brought equity action and secured a temporary injunction against sixty scalpers in Buffalo. Hearing in these cases was held Aug. 27 in the United States District Court, and on the same day Judge Hazel rendered the opinion vacating the injunction, mainly on the grounds that the railroad company was violating the anti-trust law by pooling, and therefore was not clean-handed in its appearance before the court. The opinion, however, states very clearly the right of the railroad company to limit the tickets of its issue and require signature, in which case the scalpers would have no right to deal in them. The attorneys for the railroads have made application to Judge Hazel for a rehearing of the case, submitting in support of their request affidavits showing that the Trunk Line Association is in no sense a pool and that the Justice was misinformed in this regard.

R. H. Thomas, alias J. H. Freeman, was arrested in Knoxville, Tenn., for forgery of railroad passes. He was promptly tried, convicted and sentenced June 7, 1901, to hard labor for seven months.

The Anti-Ticket Scalping law in Pennsylvania has been pronounced constitutional by the Supreme Court and has been rigorously enforced.

Aug. 14, 1901, C. J. Leonard and William Clinton, scalpers in St. Louis, were arrested charged with swindling. This arrest led to unexpected developments, as a large number of counterfeit tickets and passes were found in their office. Proceedings for forgery were at once begun, and on investigation before a magistrate both parties were bound over for trial.

Sept. 28, 1901, Frank L. Rice and Jacob Wolf were convicted of forgery of tickets and sentenced to the penitentiary. This case was handled by the Western Passenger Association from the beginning to the conviction, and from the success attending their efforts it would seem that the various associations could better attend to these matters in their respective territories than can the individual railroad companies, at least until such time as the much-to-be-desired protective bureau is formed.

In Cape May, N. J., County Court, A. H. Gordon and M. H. Kearns were, on Oct. 2, 1901, sentenced by Judge Voorhees to pay a fine of $50 and costs, the Judge in his remarks saying that in any future case the punishment would be something more than a fine.

During the period of the Pan-American Exposition at Buffalo, many tickets have been presented on the trains of the Buffalo Terminal Lines which bore the impression of stamps counterfeiting the stamps of the joint agency. After persistent effort on the part of the committee at Buffalo information was obtained which led to the arrest, on Oct. 8, of a scalper, one Charles Silverberg, on the charge of forgery, and in searching his room two counterfeit stamps were found, one being a signature stamp of Mr. H. I. Smith, Joint Agent, the other a dating stamp. No effort will be spared to convict the scalper.

On the occasion of the Christian Endeavor meeting in Cincinnati, in July, 1901, Judge Smith, of the Superior Court, granted, on application of the railroad companies, a permanent injunction forbidding traffic in the Christian Endeavor tickets.

In July, 1901, on the occasion of the convention of the Epworth League, in San Francisco, the Southern Pacific at San Francisco, and the Atchison, Topeka & Santa Fe, at Los Angeles, applied for and secured a permanent injunction against all scalpers forbidding them to handle the Epworth League tickets.

In Cleveland, temporary injunctions were issued by the Common Pleas Court, prohibiting scalpers from handling Grand Army tickets. The injunctions were made permanent Sept. 13, 1901.

The New York Central applied for and obtained a

temporary injunction against a number of ticket scalpers at Buffalo. An application was made by the attorneys for the scalpers to have the injunction dissolved. The arguments for and against this were made before Justice Lambert in the Supreme Cou t on Sept. 30, 1901, and the matter is still in the hands of the Court, nothing further having been done with it.

The M. C. B. Coupler.*

BY R. P. C. SANDERSON.

When the Master Car Builders had realized, after much hesitation, that it was up to them to agree upon a standard automatic coupler for freight service, they wrestled with the subject earnestly and long, but accomplished nothing, until at one meeting, when everyone was wearied out with the endless discussion of seemingly irreconcilable differences, the late Mr. E. B. Wall proposed a resolution, which was passed as a sort of despairing compromise to show that they were doing something at least. That committed the Association to a vertical plane coupler. . . . After the M. C. B. lines were adopted, the coupler makers and master car builders thought of nothing more than to make the shank on the coupler so that it would fit in the place of the old link-and-pin drawbars, with the least change and expense. . . . Had there been more time for deliberation after the M. C. B. lines had been adopted, had they been given to a committee of first-class mechanical designers with instructions to develop the best practicable attachment to meet all the requirements of the case, it is believed that something very different from the present style of coupler shank and draft gears would have been the result. . . . The present arrangements do not fulfill all the functions of the old link-and-pin couplings. When cars were following one another through a reverse curve, or from a tangent to a curve, or when cars of unequal lengths were passing around a curve, the link-and-pin coupling would allow the drawbar to travel laterally across one another to suit the requirements of the case. This the M. C. B. coupler as at present arranged does not provide for at all. When the M. C. B. couplers are made with a reasonable degree of correctness as to contour lines and twist, so that they will pass the gages, the lines will permit of angling between the two heads to 14 deg. on either side of the center line, which is more than ample for everything but sharp warehouse curves or leads in coal yards. When cars of approximately equal length are passing around a curve, the couplers are under no lateral strain, but simply angle on one another. But this condition, and when running over straight tracks or very slight curves, are the only conditions when the couplers are not under some lateral strain. . . . Mr. Schrover made some experiments some years ago to ascertain what these pressures amounted to for passenger cars coupled to tenders, and stated that under certain conditions they got pressures as high as 57,000 lbs.

One of the absolute necessities of the M. C. B. coupler, if it is to couple without men going between the cars to line up the heads, is that the couplers shall line up pretty closely, otherwise the lugs or knuckle face will strike on the end of the guard arms, resulting in missed couplings and damaged couplers, so that only a very little clearance can be safely allowed between the sides of the coupler shanks and the carry-iron bolts or chafing pieces as now arranged. The results from this state of affairs, which is general, are as follows, the effects being more felt on a crooked road than on a fairly straight one: Continual lateral bending and racking of the whole car framing; coupler yokes out of place on the followers, causing broken springs, etc.; loose and broken coupler yoke rivets; cracked and spread draft timbers; life of couplers shortened; wear of flanges of wheels due to side thrust on curves; wear of rail heads on curves; spreading of track on curves, and increased train resistance due to flange friction.

It is not here contended that all these results exist in a considerable degree all the time; if they did so we could not railroad as we now do. While it is impossible for anyone to estimate what the lateral pressures really are, yet a very real conception of the importance of this matter can be obtained by making tests similar to those made by Mr. Schrover for passenger cars, with freight cars of varying lengths, such as short coal cars coupled to long furniture cars with curves up to 14 deg. or even 20 deg. of curvature. Neither can anyone, even after such tests, estimate what the saving in car and track repairs would be, if all lateral pressure were eliminated, but we know there will be a saving and it is surely worth striving for.

Already many roads have recognized this trouble for their passenger equipment and use a long shank coupler having the draft attachments well back near the bolsters, and a wide carry-iron provided with lateral springs to bring the coupler back to a central position after uncoupling. According to correct mechanical principles, the draft attachments should be as close as possible to the truck center, thus relieving the car frame from lateral bending. This, however, requires a long coupler shank which is weak in buffing shocks and would bend up, besides such an arrangement would greatly increase the cost of the cars. Considering the vast number of modern cars now in service, and the cost of making any radical change, it is believed that the following suggestions will cover the points, bring the results at insignificant cost, and this arrangement can be readily applied to present cars if thought desirable.

1. Allow 2½ or 3 in. for lateral movement of the coupler head on either side of the center line.

2. Apply lateral springs to the carry-irons to return the coupler to its central position when uncoupled.

3. Make the back face of the back follower lightly convex, so that the coupler and yoke can swing from that point as a center without the strain coming on the edges of the yoke iron.

4. Guide the back of the yoke so that it cannot get out of its central position.

5. Make the front face of the front follower convex to a radius equal to the inside length of the coupler yoke.

6. Make the lateral springs long and amply strong enough to readily return the coupler to its central position, but avoid unnecessary stiffness. In this way the present coupler and yoke springs and draft gears can be retained, only the followers with the carry-iron and its lateral springs, with the malleable iron pockets and chafing stirrup, need be of new design.

It has been contended that the swing motion truck is the true remedy for the difficulties referred to in this paper; but the swing motion truck has troubles of its own, and it is not believed to be good mechanical design to try to overcome defective design in the draft gear by modifying the trucks. Rather the trouble should be properly provided for in the draft gear itself.

*A paper presented at the October meeting of the Western Railway Club.

Pennsylvania Railroad Changes in Philadelphia.

The Pennsylvania Railroad has begun building the approaches for the revised lines through West Philadelphia. The elevated road from Broad Street Station, about ¾ of a mile to the Schuylkill River, is not materially affected, although it has been widened by extending the arched viaduct on the north side for a short distance east of the Schuylkill. The revised location which has been adopted however requires, south of the present structure, the building of a new double-track deck bridge (three spans of about 160 ft. each) to carry the trains of the New York Division and the Pennsylvania Railroad Division. North of the present structure a new double track through bridge (3 spans of about 160 ft. each) will be built to carry the Philadelphia, Wilmington and Baltimore trains. The present structure carries three tracks, one for inbound P., W. & B. trains, one for inbound P. R. R., and New York Division trains, and one for outbound trains of all divisions. The P., W. & B. trains outbound separate from the others by a rapidly falling grade leading to the tunnel under the P. R. R. and New York Division tracks. The proposed revision separates both the inbound and outbound P., W. & B. tracks from the other tracks before crossing the Schuylkill River. The P., W. & B. tracks as at present will run on a descending grade less than 1 per cent. curving to the southward to enter the present tunnel under Market street. On the other hand, after crossing the Schuylkill River, the P. R. R. Division and New York Division will adopt an entirely new location, and immediately west of the Schuylkill River will develop into a four-track line, the two outer tracks for the use of the New York Division and the two inner tracks for the use of the P. R. R. Division trains. These tracks will run with a slightly ascending grade and curving northwestward through the present West Philadelphia freight yards, touching Market street at Thirty-first street about 10 ft. above the grade of that street and 29 ft. above the P., W. & B. tracks. At this point a union passenger station will be built, with platforms above Market street for the P. R. R. and New York Division trains, and platforms below Market street for the P., W. & B. trains. This arrangement will enable the transfer by stairways and elevators of passengers between local trains of the three systems, and will enable the company to abandon the present Powelton Avenue Station of the New York Division and P. R. R. Division, which is situated about a mile and a quarter from Broad Street Station and is not very convenient for West Philadelphia travel.

The Congressional Limited and similar trains running through between Washington and New York do not run into Broad Street Station. Their only Philadelphia stop in West Philadelphia is at Powelton Avenue Station, and the connecting track over which these trains run between the P., W. & B. system and the New York Division and P. R. R. system will be re-located and run from the new union station on an ascending grade from the P., W. & B. tracks to the New York Division and the P. R. R. Division tracks at about the same point as at present.

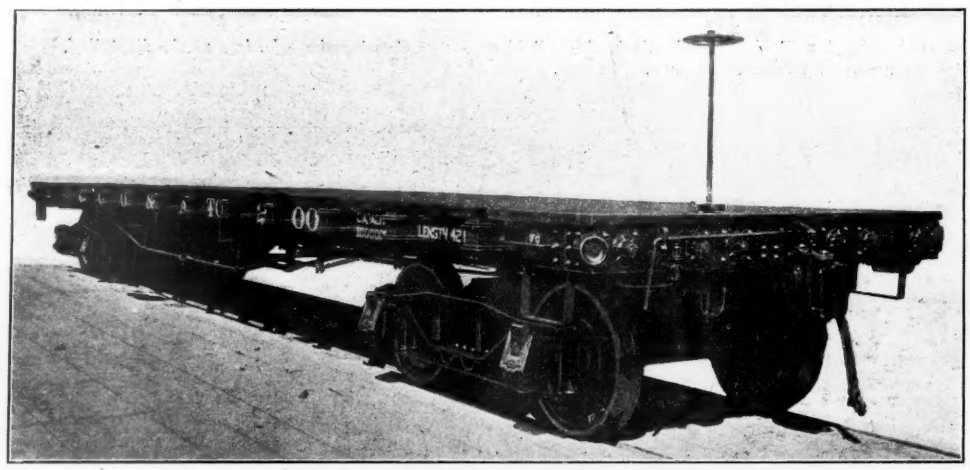
The present bridge over the Schuylkill River will be retained, and will lead to a storage passenger car yard west of the Schuylkill at a convenient distance from and on the same level as the Broad Street Station yard on the elevated railroad. This new yard will be much more accessibly located as a storage and shifting yard than the one now in use, which is at a low level reached by a rapidly descending track in the neighborhood of Powelton avenue.

The revision presents some difficulties in the way of grades and curves at the new station, but the complete separation of the tracks of the different lines, the advantages of a convenient union station in West Philadelphia and the more compact arrangement of the Broad Street Station yards, it is confidently expected, will justify the changes in the course of construction. When it is remembered that the scheduled trains for every weekday make a total of 250 out and 250 in, and that these scheduled movements require something like an equal number of shifting movements in and out of Broad Street Station yard, it can be readily understood that better and more convenient facilities will necessarily precede the natural and anticipated growth of the passenger business.

The new work will require more than a year to complete, the most difficult portions being the two new bridges over the Schuylkill River, the new station, and the reconstruction of the Thirtieth and Market Street Freight Station yards.

100,000 Lbs. Capacity Steel Flat Car—Chicago & Alton Railway.

The Chicago & Alton has recently built in its Bloomington shops some interesting steel flat cars of 100,000 lbs. capacity. In designing these cars the chief idea was to obtain the greatest carrying capacity possible with the least dead weight and the underframe adopted consists of commercial rolled shapes reinforced by truss rods. Material for repairs of these cars can therefore be readily obtained. The construction is shown by the accompanying engravings and the car is calculated for a uniformly distributed load of 100,000 lbs. The general dimensions are: Length 42 ft., width 9 ft., and the floor at the center of the car is 4 ft. 1½ in. above the rails. The weight empty is 33,900 lbs. and under a test load of 112,251 lbs. of old cast-iron wheels the car deflected about 1 in. below the horizontal line, but regained its original camber after the load was removed.

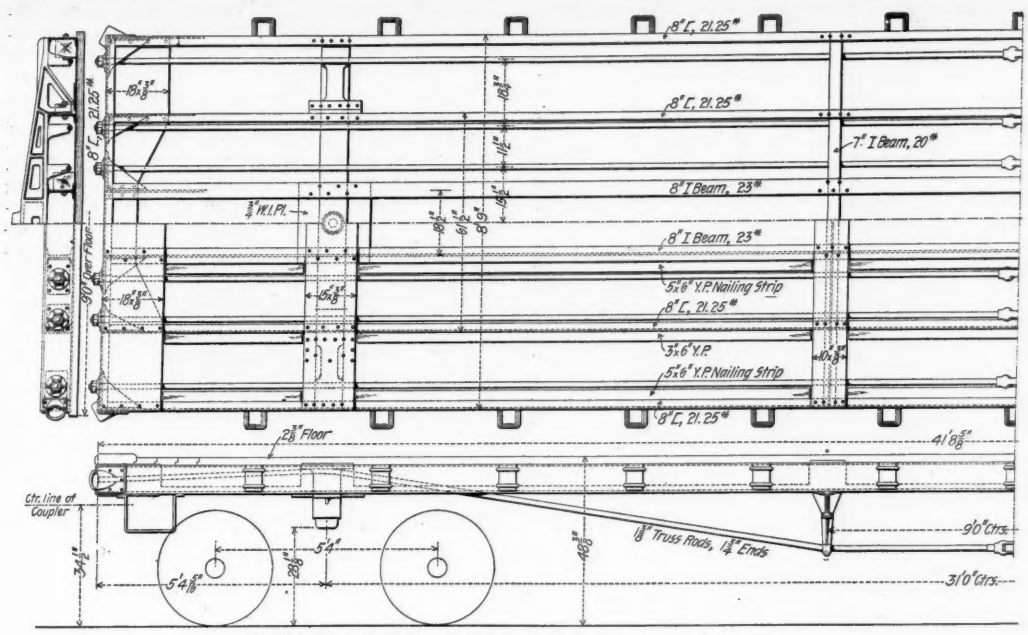


Chicago & Alton 100,000 Lbs. Capacity Steel Flat Car.

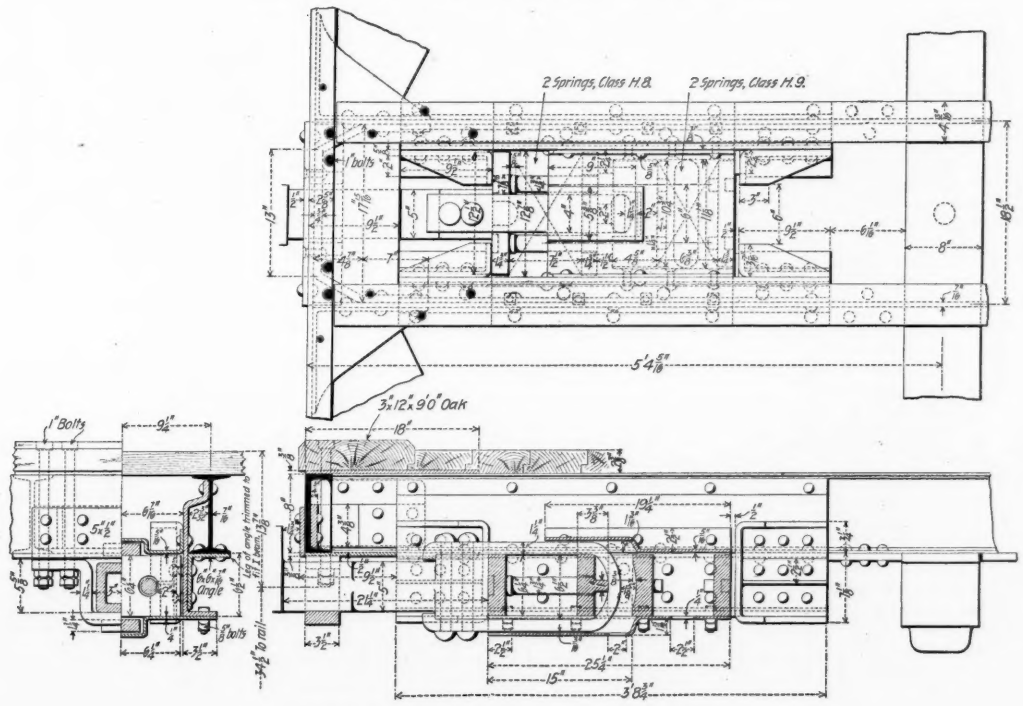
The side, intermediate and end sills are 8-in., 21¼-lb. channels and the center sills are 8-in., 23-lb. I-beams. There are six 1⅜-in. truss rods with the ends upset to 1¾ in. The longitudinal sills are securely connected to the end sills and body bolsters through plates, and suitable malleable iron fittings. The end construction of the car is particularly strong. It will be seen that in addition to the malleable iron fittings connecting the webs of the longitudinal sills to the end sills, ⅝-in. cover plates are used above and below the sills. The end sills are also securely reinforced to withstand blows that may come on them from the horn of the coupler. All special-shaped details are either pressed steel, cast steel or malleable iron, no cast-iron being used in the construction of the car.

The flooring is 2⅜-in. yellow pine with ship-lap, and is secured to nailing strips placed alongside the longitudinal sills where accessible and bolted directly to those sills. At the ends of the car the flooring is increased in thickness to 3 in. The hand-brake shaft above the floor is removable to allow loading material longer than the body of the car.

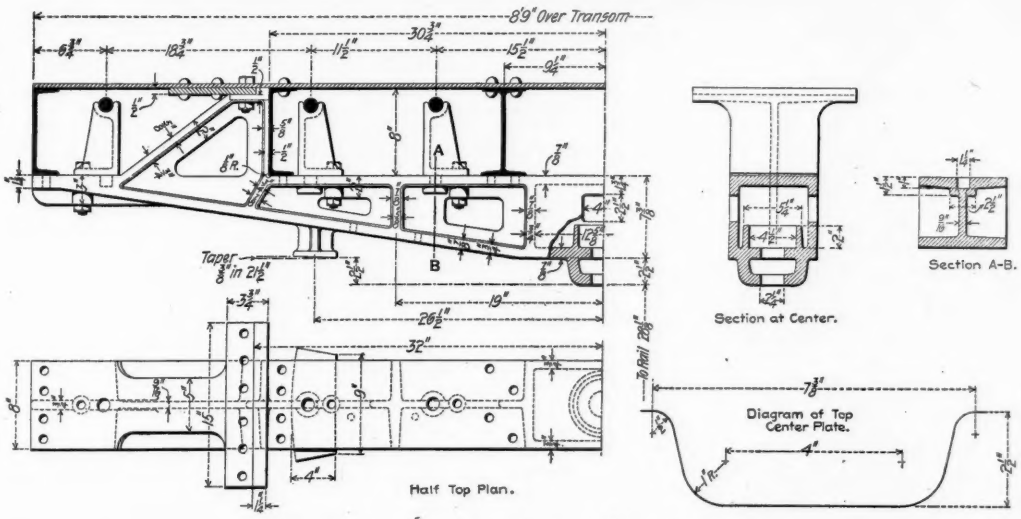
The body bolster is cast steel and is shown in detail. It will be seen that the bolster is greatly strengthened by extending the casting up alongside the intermediate sills to form part of a truss. A ⅜ x 15-in. cover plate connects the upper flanges of the sills and also acts as



100,000 Lbs. Capacity Steel Flat Car—Chicago & Alton Ry.



Details of Draft Gear—Chicago & Alton Flat Car.



Cast Steel Body Bolsters—Chicago & Alton Flat Car.

the tension member of the body bolster. This body bolster can be taken down simply by removing bolts and without interfering with the underframe.

The draft gear makes use of four springs, two in front and two behind. The forward pair takes all the pulling forces and the rear pair only assists in buffing. The front springs have each a total capacity of 13,970 lbs., and the back springs have a total capacity of 19,150 lbs. The back springs are only used in resisting shocks and are compressed when placed in the car to within about ⅜ in. of the solid height. Thus they act chiefly as a yielding cushion which does not come into play until the front springs have done their work. The method of attaching the gear to the tender sills is clearly shown by the detail drawings. It will be seen that a tie plate riveted to the center sills is inserted between the rear of the draft gear and the body bolster and a similar plate back of the bolster assists in holding the body bolster in position.

The trucks are of the pressed steel arch bar type with 5½ x 10-in. axles. National-Hollow brake-beams and Janney couplers of an extra heavy type are used.

A compulsory scheme of retirement from active service at the age of 65 of all responsible officials and stationmasters in the service of the North British Railway Company will, it is stated, come into force early in the new year. Some time ago a superannuation scheme was perfected, and it is stated that all the officials about to be retired compulsorily will receive something like two-thirds of their present full pay. The enforcement of the scheme will affect quite 50 officials, some of them very highly placed.—*Transport.*

Pooling Locomotives.*

Mr. David Van Alstine (Chicago Great Western).—I suppose I was called on to open this discussion with the idea that I must have some valuable information in the way of data and figures, but I haven't any, and I never have seen any that appeared to me to be very reliable; in fact, I am pretty well convinced that any information applying to one road, comparing pooled engines and regular engines, would not apply at all to any other road, where the conditions are different.

In considering the pooling of engines, you can look at it from three points of view, convenience, efficiency and cost.

As far as convenience goes, I do not think there is any question but that pooling is far superior to assigned engines, in that the engineers take their regular turns out, and no special engines have to be provided for them. The engine that is most available is sent out, provided it is of a class that suits the despatcher; and further than that, in times of heavy business, you can get more mileage out of the same number of engines by providing extra crews.

As regards efficiency, it seems to me in the very nature of things that there must be more engine failures with pooled engines than with regular or assigned engines. Even though you grant that the inspection of pooled engines by roundhouse inspectors is just as good as by engineers—and I haven't a doubt that it is—there are a great many hidden defects about engines that cannot be discovered by anybody except the men who run the engines. The engineers are, in my experience, not as interested in the engine in pooling as they are with assigned engines, and that being the case, I do not see how you can help having more trouble with pooled engines. Under favorable conditions of loading, double track, good water and coal, I believe that a pool can be run with almost as much success as assigned engines.

Now, as far as cost is concerned, supervision, i.e., the expense of foreman and division master mechanics, is undoubtedly higher with pooled engines than with assigned engines. It has to be so, because you have got to put enough more money into supervision to "boost" the men up to the interest in their work that they would naturally take if each man had his own engine. But the supervision is a small item in the total expense, so that does not cut much figure. In oil, waste, supplies, wipers and despatchers I doubt if there is any noticeable increase. In the labor item, there are inspectors in the roundhouse, and men who fill and clean headlights, and such men; that will add somewhat to the payroll, but it is hardly appreciable. So far as repairs are concerned, I never have been able to convince myself that there was any increase at all in maintaining pooled engines over assigned engines. The engine in the pool runs up such a big mileage that that brings down the repairs per mile. I do not believe that in my experience I have been able to find that repairs per mile increase, and I am rather inclined to think that they decrease. So far as I am able to judge, pooled engines are making about the same mileage between general overhaulings that assigned engines are.

The little information that I have been able to get at, in comparing consumption of coal by pooled engines with that of assigned engines, leads me to think that there is about 5 per cent. difference in favor of the assigned engine. I think it is natural that there should be some difference in that direction, and I believe there is. That figure, however, is largely guesswork. But even assuming 5 per cent. difference in the coal bill, and assuming that we can get 50 per cent. more mileage out of a pooled engine than we can out of an assigned engine, the interest on the investment in additional engines to give each man an engine, would more than offset that saving.

In general, my opinion of pooling as compared with assigned engines, is that, looking at it as a motive power man who is looking for peace and comfort, I would prefer to have every man have his own engine. If I were a railroad manager, however, furnishing the money, I should certainly buy enough engines to do the business when it is heaviest.

Mr. John Tonge (Minneapolis & St. Louis).—We have been pooling engines now for something over three years, and as to failures, I do not know as I can say there are any more failures with pooled engines than there was with the non-pooled engines. I can give every one of them for the past seven or eight years back; every failure of every kind; every delay of every kind; and I do not think that delays or failures from pooled engines will be any greater than with the non-pooled engines.

Mr. A. Lovell (Northern Pacific).—We are pooling engines somewhat on our road, as a necessity. I do not think from choice I would select that method of operation. I think Mr. Van Alstine has expressed my views pretty clearly in the matter. Most roads will have only so many engines as are required in the busy season, during which all the engines they have must be brought into service. When the dull season comes there seems to be no necessity for pooling engines. If they are pooled, and certain engines are kept going all the time, there are other engines that do not get out at all, which seems to me to be not good policy. I believe it would be better in such cases to have regular men assigned to regular engines, and have all the engines do a part of the service,

*Abstract of a discussion at the September meeting of the North-West Railway Club.

rather than have a part of them laid up and not all of them in the service part of the time.

Local conditions will much alter the requirements. For instance, take a district where there is very bad water. Engines have to be washed out perhaps every round trip. With the large engines that are used on some roads at the present time, it requires from 6 to 10 hours to properly blow off the steam and cool the engine off; get it washed out and fired up again, and any reasonable engineer can get as much rest as he wants in that time. So that in cases like that there would not be anything to be gained by the pooling system.

Again, on some districts, engines of very different character are in service. Perhaps very heavy compound engines will be used on some trains—through freights, perhaps; while local freights will be using light standard engines or light moguls. In this case, if engines are pooled for all trains, men first have an engine of one kind—that is, if the men are pooled with the trains as well as the engines—engineers on a run will have a heavy compound engine or a heavy simple engine on one trip and on the next trip they may get a light engine very different in character, and I do not believe it is possible for any engineer to do as economical work on the road when he is shifted about on engines that way, as if he had the same character of an engine every trip. If engines were all alike, I do not see why an engineer cannot do as efficient service on one engine one trip as on another engine another trip, if he is capable.

My opinion of this question is, that when it is necessary to pool engines to meet traffic requirements, we should do it, if anything is to be gained; if any more ton miles can be made by the engine by so doing we should not fail to do it. But when business slacks up so that it is possible to assign men to their regular engines, I think that should be done.

Mr. Van Alstine.—On the road with which I was connected for a number of years before I came here, I believe the men would dislike to go back to regular engines, because the present generation of engineers have never known anything else, and they know what the work is about a regular engine that they do not have now, and they are satisfied to let it stand as it is.

On our road I should say that our pooled engines average 4,500 miles, but I have been told recently that on the Pennsylvania road out of Pittsburgh, they expect their pooled engines to run up to 8,000 or 9,000 if necessary. Now, pooling under these conditions cannot help but be economical, and under those circumstances I consider that it is the only way to run engines in good times or dull times, because there is money in it.

The Air Brake.

At the last meeting of the New York Railroad Club Mr. F. M. Nellis presented a long paper on Brakes in "Railroad and Street Car Service," which was well discussed by specialists. A few extracts from that paper follow, and probably we shall give more in a later issue.

It has been generally conceded for some time past that the railroads of the East are somewhat tardy and behind those of the Far West in air-brake maintenance. This is only natural and to be expected when we recollect that the freight train brake had its introduction on the mountain grades in the Far West nearly ten years before it was seen to any extent in the East.

Should a close investigation be made of air-brake doings in testing and repair yards, roundhouses and shops, a large number of roads would find that their machine of air-brake practice and maintenance is working at very low efficiency. What is first and more needed than anything else, perhaps, is a candid recognition of the fact that the air-brakes in freight train service to-day are not receiving the attention they should.

An honest appreciation of this condition, and an organized and systematic effort to better look after the road practice and air-brake maintenance will result in a wonderfully improved showing, as well as increased safety and a better movement of trains in heavy traffic.

What are we to do to better our air-brake service which we are so candidly informed is not up to the highest standard? Procure the services of a first-class general air-brake inspector, give him full authority in everything pertaining to air-brakes, and hold him responsible, having him report directly to the Superintendent of Motive Power or the General Superintendent. The first and most important qualification of a general air-brake inspector is that he must be a leader, a man of character and ability, and competent to handle men. He should know the manufacturers' method of building brakes, etc. He should know the best designs for applying brakes to locomotives and cars, and know how to steer the drawing room away from the faulty ones. He should be thoroughly conversant with the construction and operation of brakes, train handling, and yard and shop repairing. He should be able to give proper and thorough instructions in the operation, inspection and repairs of all parts of the air-brakes. If he is supplied with an instruction car fitted up with air-brake material for instructing employees, he should put in alternate weeks in the car instructing, and on the road about the shops and yards, giving practical illustrations and object lessons. He should know all that is going on in the air-brake line over the entire road, in all of the shops, offices and drawing rooms.

To illustrate this by an actual example I will cite the case of a newly appointed and aggressive Superintendent of Motive Power who, after carefully touring the road and observing existing conditions, determined to reorganize the then chaotic air-brake department. After much deliberation he finally selected from the ranks for general air-brake inspector a man who has since proved himself the right man in the right place. This man receives a salary of $175 per month and expenses, and is worth it. The first year he so reduced the number of slid flat wheels as to represent a saving of more than four times his salary. In the past year the slid flat wheels on this line have been reduced to a minimum, the cost of the spoiled wheels not aggregating half the salary of the inspector. The saving cited is only one of a number.

Another general air-brake inspector on a neighboring road with a New York terminal has, by thorough instruction of the employees and improved methods of train handling and maintenance of air-brakes, succeeded in reducing the number of break-in-twos in the past year to such an extent that more than $11,000 has been saved in wrecks due to trains breaking in two and running together. This man is another man in the right place. He receives a salary of $150 per month, and is scheduled by his Superintendent of Motive Power for a substantial increase.

Still another inspector, some distance removed from New York City, has so successfully conducted the air-brake department for his road and saved enough money in net results for the company that his General Manager feels justified in paying him $225 a month and expenses.

To illustrate the value of assimilation of air-brake instruction, the two contrasting cases which actually happened are cited as follows: A prominent railroad had a contract to deliver an all air-braked, 16-train of race horses at a specified time, under a heavy forfeit in the event of failure to place the train at its destination at the hour contracted for. There were three divisions over which this train had to pass, and it was even given rights over passenger trains. The first division, of nearly 100 miles, was covered in a little more than 2½ hours without delay or incident. Nearly one-half of the second division had been gone over when the air-brakes seemed to take to doing queer things—refusing to release, except for a short time, then re-applying. The engineer could find nothing wrong with the brakes on his engine, and, after nearly an hour's time had been lost in vainly seeking for the cause of the trouble, another engine was telegraphed for. Upon the arrival of this second engine, after nearly three hours' total delay, the arriving engineer discovered that the cause of the trouble was a loose nut whose office was to hold the air pump discharge pipe to the main reservoir, but which had worked loose and allowed the main reservoir pressure to escape as fast as the pump could supply it. A few turns of the monkey-wrench brought the nut up to place, transformed the cranky brakes into well-behaved ones, and the train proceeded. However, it reached its destination a little over an hour late and the company was obliged to pay the forfeit, having practically hauled the high-priced train over the road for nothing. The engineer responsible for this failure had a fair rating in the instruction car, and could answer questions very well.

On another road three heavy excursion trains were bound for a seaside resort with nearly 4,000 passengers aboard. The excursion was an exceptionally good-paying one, and had been secured by the passenger agent after much hard competitive work. When the three sections, which were running close together, were about 40 miles from this city, the engine on the first section had trouble with the air pumps which stopped and stubbornly refused to restart. While the fireman was taking water at the next station, the engineer, who had shut off the steam from his pump, coolly and intelligently diagnosed the case, believing that he knew where the trouble lay, unscrewed the cap and fished out a broken reversing piston. Hurriedly running across the tracks to a nearby switch engine he exchanged reversing pistons with the switch engine and dropped the good piston into his own pump, tightened up the parts and the pump went off all right. The work was so quickly done that the train despatcher knew nothing of the break-down.

One far Western inspector reports admirable results from his use of the recording gage on trains running over the heavy grades of the Rocky Mountains.

Figs. 1 and 2 are reproductions of charts produced by the pressure recording gage as taken by this inspector. Fig. 3 is the profile and speed chart. Note the slight variation in speed between 15 and 20 miles per hour from the third to the tenth mile, then the increase to 25 miles per hour to carry the train over the half-mile stretch of level track so the retaining valves need not be thrown out of operation, and then the settling down to a uniform speed of 25 miles per hour on the easier grade. Fig. 2 shows the brake cylinder pressure of the successive applications. Note the uniform pressure; also the two groups of pressures for the heavier and lighter portions of the grade. The lowest brake cylinder pressures were between 20 and 25 lbs., while in the preceding case they ranged between 3 and 23 lbs.

Proper and thorough instruction of employees in itself will not procure best results in train operation unless the air-brake equipment is carefully inspected, tested and maintained. Even the best workman cannot do high-grade work with poor tools. To better attain good air-brake service terminal points should be equipped with yard testing plants where the passenger coaches and freight cars may be tested and, if necessary, be repaired. Some years ago it was a practice to do nothing with the air-brakes on a train until after it had been coupled up, the engine attached and the train ready to proceed. Then, when everything was in a hurry, and departure was being urged by the train despatcher and yard master, the testing of the air-brakes had to be done. If any defect developed, the delay required in which to place the defective part in good condition was charged up to the air-brake. In many cases the repairs were made by the trainmen themselves. In late years, however, as the necessity for better maintenance of brakes becomes better appreciated, this work is taken from the trainmen and given to a regularly organized corps of men whose duty it is to properly inspect, test and repair the apparatus in the coach yard before the train is backed down to the station. Instead of the work being done at the station platform immediately prior to the starting of the train, it is done while the cars are lying in the yard on the test tracks. This is a great improvement over the old practice.

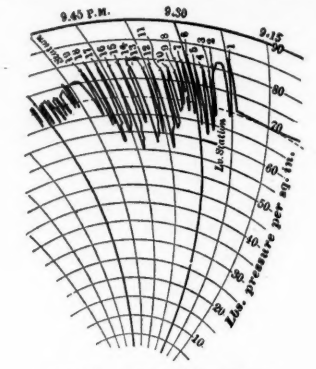


Fig. 1.—Train Pipe Chart.

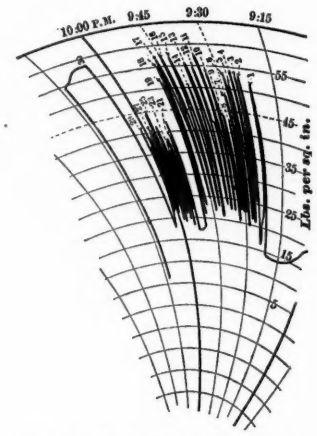


Fig. 2.—Brake Cylinder Chart.

The air-brake equipment on the locomotive should be likewise tested while the engine is standing in the roundhouse or at least some time prior to coupling to the train. It would be folly, indeed, to delay the test of the air-brake apparatus on the locomotive until such time as the locomotive was coupled to its train.

A portion of the yards where freight and passenger cars lie before being made up into trains should be ar-

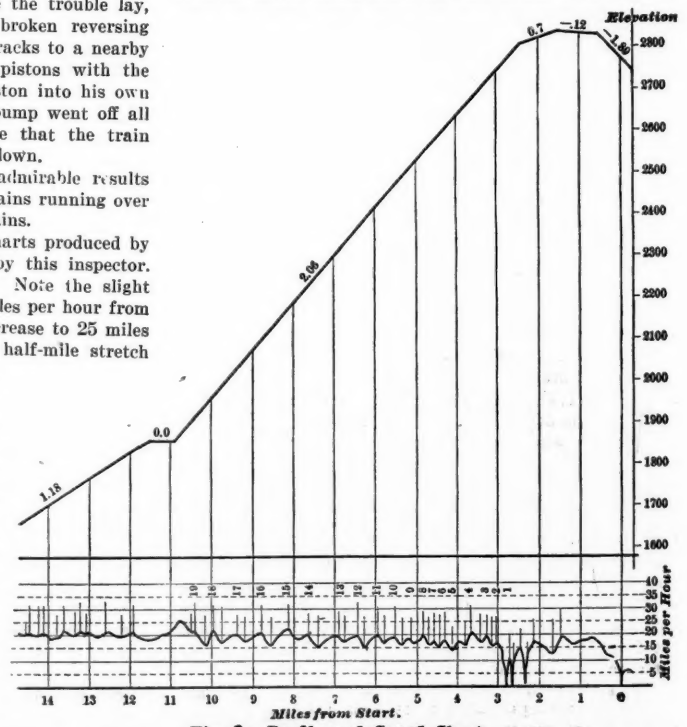


Fig. 3.—Profile and Speed Chart.

ranged with piping, suitable valves, etc., for testing the brakes on these cars while they are lying idle, and not wait until the train has been made up, engine coupled on and ready to depart. A large number of the principal railroads have installed such plants in both their passenger and freight yards. Several roads in thus installing yard testing plants have been obliged to lay additional tracks, or in some way possible, modify their method of switching and making up trains in order that a portion of the yard may be given over to the piping of the tracks and the testing of air-brakes. There are a few yards, however, where no changes have been made, and all proposed modifications are stubbornly resisted by the yardmaster and others who insist upon conducting the making up of trains as they have always been accustomed to do, regardless of the growing needs of the air-brake service. Such opposition as this is a severe check to the maintenance of air-brakes, and can only be effectively overcome by the kindly assistance and timely intervention of some of the higher operating officials.

In addition to the yard testing plant there should be arranged suitable repairing facilities where brakes may be repaired when found to be in need. Tracks at loading sheds and freight houses, also other places where cars are stood for loading, should be piped so the brakes on those cars may be inspected and tested while the cars are being loaded.

A roomy, light place, separated from the work of the main shop, where nothing but air-brake work shall be done, should be supplied to the air-brake testing and repairing department. One portion of this separated department might be further set apart and utilized for the repairs of injectors, steam gages, lubricators, etc. One corner of this air-brake room should be conveniently arranged for the dismantling of air pumps, brake valves, triple valves, etc., and a lye bath heated to the boiling point by steam pipes where the parts may be immersed and cleansed of their dirt and gum before the work of repairs is commenced, should be located near by. Suitable benches and other apparatus for conducting the work of necessary repairs should be supplied; there should also be a bench for reassembling the parts after they have been finished. If possible a lathe or two, or other special machinery necessary for doing air-brake work should be supplied this repair room. A rack, suitably piped and connected with both steam and air pressures for testing the finished work, should be installed by all means, as the testing of repaired work frequently proves that feature to be equally important as the repairs themselves.

Air pumps, after they have been repaired, should be placed on a testing rack and run a few days to wear them down to a bearing and get them in condition before putting them in service on the locomotive. Thus they will be able to immediately enter hard service without any danger of breaking down or heating. The air pumped during the wearing-down process may be used to assist in supplying the pneumatic shop tools.

A number of spare air pumps, brake valves, governors, triple valves, etc., should be kept in stock to replace reported parts on locomotives in the roundhouse. As far as possible roundhouse repairs should be abandoned in favor of supplying new parts from the repair room for the ailing parts reported. In fact, the air-brake repair and testing room should be somewhat in the nature of a tool room, remote and distinct from the main shop and supplied with its necessary individual apparatus.

The efficiency of air-brakes on cars and locomotives may be highly increased by a good inspection and maintenance system. The regular daily inspection of passenger car brakes should be made in the yards where the cars lie, the cars gone over by the inspector to observe that the proper piston travel is being maintained, worn-out brake shoes replaced, and to know that the levers do not strike the carrier irons.

The triple valves on freight cars should be cleaned and lubricated once in 12 months, and on passenger cars once in six months. The brake cylinder should have its piston and attached parts removed, cleaned, oiled and tested once in 12 months. The old practice of removing the oil plug from the brake cylinder and pouring in a quantity of oil is wrong and detrimental. Besides destroying the rubber seat of the emergency valve of the triple, this practice merely floods the bottom of the cylinder and piston packing with oil and leaves the top and sides dry, where the pressure will blow past. A much better practice, and the one that is recommended by the Air Brake Association, is that of using as a lubricant a good cylinder grease instead of oil. Unscrupulous manufacturers of brake cylinder greases have put such poor grades on some roads that those roads imposed upon have gone back to the use of oil.

After the brake cylinder and its parts have been properly cleaned and lubricated, and the triple valve has been likewise attended to, the brakes should be tested to see that the work is properly done. In fact, the proper testing of brakes after cleaning and repairing is an equally, if not more, important feature of the process. At this time the retaining valve should also be tested to ascertain whether it will perform its work on mountain grades, although the repairs made may have been made on a level road where retainers are not used. Out of 100 cars of various lines recently tested in a certain repair yard to ascertain the condition of the retaining valve, but 17 cars were found whose retaining valves and pipes were sufficiently tight to retain pressure more than one-half minute.

The air hose should be kept coupled up and not permitted to hang loose and dangle. A well-designed and properly located dummy coupling will assist in preserving hose and maintaining brakes, but keeping hose coupled up on trains en route will contribute equally as much.

Another very great advantage in having all cars coupled up and their brakes working is in case of accident, the available braking force is always at its maximum. One good stop of a train may prevent an accident which will compensate for the additional trouble taken for coupling up all cars for an entire year. This is better appreciated by the trainmen on the road who frequently switch the air-braked cars together at some convenient point after the train leaves the yard. A road will also require a better maintenance of train pipes if all cars are kept coupled up.

The regular daily inspection of engine brakes should be made with respect to proper piston travel on the tender, which should be from 6 to 7 in., and on driver brakes, which should be from one-third to two-thirds of the stroke. The supports which carry the cylinder levers should offer free movement to the levers and not permit them to strike. On a group of engines inspected by the writer two months ago the tender brake cylinder levers on seven engines out of 10 pitched up against the carriers. The equipment had been running in this condition for months and this road complained of slid flat wheels, as might be expected.

Special attention should be given to the condition of the leather packing in the cylinders of the driver brake, as more available braking power is sacrificed there by the burning out of the leather packing, due to the close location of the cylinder to the fire-box, than on any other vehicle in the train. A little over a year ago the writer had occasion to inspect the driver brakes of some locomotives on a certain road not far from New York City and found out of 12 locomotives that but two had driver brakes that would remain set more than 30 seconds, the pressure leaking out past the burned leather packing in the cylinder, the gaskets in the pipe unions and in the joint under the head of the brake cylinder.

On the New York, New Haven & Hartford road an excellent practice is followed of placing a pressure gage in the cab in front of the engineer's brake valve, so attached that it may be cut into either the air signal line or to the driver brake at the option of the engineer. When the locomotive is handling its train on the road the gage is cut into the signal line, thus keeping the engineer advised of the pressure in the signal line and the condition of its parts. At the terminal point the gage, by simply turning a small cock, may be made to disconnect from the signal line and connect with the driver brake cylinders, thus showing the condition of the piston packing leather and the pipe joints in the driver brake. This device and practice has resulted in the lifting of the driver brake efficiency on the New Haven road to a height second to none and far above quite a large majority. This practice is also being followed on the Boston & Albany road, which also reports excellent results from the scheme.

Not two months ago, on another road east of the Mississippi River, there was a collision between two trains in which the pilots, headlights and front ends were demolished, but there were no lives lost. It was afterwards discovered, but not reported, that the locomotive driver brakes were in a very bad condition and actually furnished no retarding power. The cylinders on one locomotive were located against the fire-box in such a position that the piston packing leathers had dried out and allowed pressure to rush readily past them. On the other locomotive the driver brake, which was a push-down, equalized type, had its cylinders located forward under the boiler in such a position that it was impossible to remove the top or pressure heads to inspect the condition of the piston and its attachments. These parts were found badly out of repair and leaked pressure past them as rapidly as it was admitted to the cylinder, the only application possible being the emergency when the pressure was turned suddenly and in a large volume into the cylinder.

On passenger trains, where conditions do not prohibit, the brakes should be applied lightly by the engineer when pulling out of his terminal station and before attaining a speed of more than eight or 10 miles an hour, just sufficient to feel the retarding force of the brakes on the train. This will give him a good idea of how the brakes are going to hold. This test is known to air-brake men as the "running test" and has been found very valuable in addition to the terminal tests, but should not be considered a sufficient test in itself. Should conditions prohibit the "running test" the engineer should calculate on making a "wide" stop at the first station; that is, he should begin to make his stop farther back than usual in order to be assured that the brakes are going to hold, and in what degree.

The first reduction in making an ordinary stop should be a heavy one, say from eight to 10 lbs. This gives a high braking force at the time when the speed of the train is high and more nearly approaches the principle of the high-speed brake. When the speed of the train has been reduced to about 10 or 15 miles per hour the engineer should release, but not recharge, and finish making his stop with a second and lighter application than the initial. This will permit him to hold his brake on if necessary, and the resultant tipping of the trucks and the shock which follows will not be nearly so great as if there had been but one application and the brakes held on. This is known as the "two application stop," brings down the speed of the train quicker, and causes less of a shock at the finish generally than the "single application" method. The engineer should figure to throw his brakes off before the train comes to a full stop, thereby preventing the recoiling action of the trucks and the consequent shock to passengers.

The handling of long freight trains is somewhat different from that of ordinary passenger trains. The "running test" should not be made; the terminal test having been properly and carefully made may be accepted as final. The initial reduction, in making a stop with freight trains, should be one of about five to eight pounds, or longer, if the train length requires it, to take up the slack. Then additional braking power may be added as the engineer sees fit. Once applied, the brakes should not be released on a long freight train running at slow speed until after it has come to a full stop. The reason for this is that the head brakes, being near the engine, will release first and permit the slack in the forward part of the train to run out and stretch the couplings, the rear brakes remaining on and being liable to break the train in two.

The application of brakes on a long freight train should never be followed closely by a release of brakes, as this would permit the head brakes to be releasing while those on the rear end were still setting. This peculiar state of affairs is due to the tardy influence of the reduction on the rear end which is not felt as quickly as on the head end, and, on account of the great length of train pipe and friction therein, may be so far delayed as to have the brakes applying on the rear end and releasing on the head end, if a release closely follows an application. The release should not be made until after the train pipe discharge at the brake valve has ceased. This phenomenon of releasing at one end of the train pipe and applying at the other is equivalent to the old result had by attempting to handle a long train of air-brakes with a non-equalizing brake valve, which allowed the head brakes to release because of the train pipe pressure flowing ahead and knocking them off while the rear brakes were still setting.

Perhaps one of the strongest appealing features in air-brake practice to the railroad manager, and one which speaks intelligibly and forcibly in a language of dollars and cents, is that of slid-flat wheels, and replacing them with newly-fitted wheels is quite an expensive operation and is well understood and appreciated by railroads.

Perhaps one of the most prolific causes for slid-flat wheels is that of setting hand brakes on cars in yards and pulling the cars from one place to another. Another prolific source of flat wheels is the bad condition of the rail in foggy, frosty weather, thus reducing adhesion. A number of roads have been able to largely avoid trouble under these conditions by issuing an order that the engineer in applying brakes shall make two applications of the brake in making a stop—the first a heavy application to check the speed of the train, and the final application, a lighter one, to bring the train to a standstill.

Freight cars should also have the M. C. B. recommended rigging, staunch brake-beams, and brake-shoes which have a reasonable coefficient of friction and not too long life. Hard brake-shoes which wear for too long a time do not give as good actual braking service as do softer and shorter-lived shoes. However, the Master Car Builders' recommendation in this respect may be profitably and advantageously adopted. In substance they are: A brake-shoe which has a reasonable life and good holding quality. There are some brake-shoes on cars throughout the country which give almost as little retarding force to the wheels as if one smooth surface of glass were rubbed upon another. A prominent private car owner in one of our large Western terminals, when approached by a brake-shoe representative, replied that it was a matter of supreme indifference to him whether the brake-shoes on his cars had any retarding power or not so long as they kept their place on the brake-beams and passed inspection in yards. It was found that the brake-shoes on this owner's cars were of the hardest kind purchasable and furnished an exceedingly low coefficient of friction. Mr. Otto Best, the General Air Brake Inspector of the N., C. & St. L. Railway, at Nashville, Tenn., made a characteristic remark that the brakes on his locomotive tenders always held. He said he knew this because the brake-shoes always wore out rapidly.

It is a recognized fact that one of the most important matters in air-brake practice is that all cars in the train shall have, as nearly as possible, a uniform adjustment of piston travel. In order that this travel may be uniformly maintained, it is necessary that it be inspected and cared for at each terminal point, or elsewhere, as frequently as practicable. Besides reduced brake efficiency, the many cars in long freight trains with varying piston travel will cause a surging and jerking that is detrimental to the draft gear of the cars and the lading and invites accidents from breaking in two. The nearer uniform adjustment of piston travel can be maintained the nearer to a minimum will these objections be driven.

The automatic slack adjuster mechanically takes up the slack when the wear of the brake-shoes permits the piston to travel beyond the prescribed limit. This is manifestly much superior to the old practice of hand adjustment, which is irregular and insufficient. The running piston travel is a wholly important point to be considered in piston travel regulation, and it is perhaps a well known fact that the mere adjustment of piston travel, when cars are at rest, does not insure uniform travel when the cars are running with the brakes applied. Nothing but a mechanism which will automatically regulate the piston travel when cars are running with the brakes applied can insure maximum and uniform brake efficiency.

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The reader will see in another column an account of the organization of a technical railroad club in Pittsburgh to be known as the Railway Club of Pittsburgh. This club, it will be observed, occupies an important center at some distance from any other club of the sort, the nearest now in existence being the Central Club at Buffalo. No other form of organization for mutual instruction has been so vigorous or so useful in the last ten years as these clubs, which have multiplied, and increased in membership, amazingly. They have come now to be a substantial element in the growth of the art of railroading in this country, and, when we consider their numbers, their incessant activity, the scope of their inquiries and the unflagging zeal of their members, there is no great risk in saying that they are to-day even a more important element in railroad development than the Master Car Builders' and Master Mechanics' associations. However, a comparison of this sort is liable to be misunderstood, and it cannot be accurately and conclusively drawn, for the two classes of institution are not really comparable, and they have their own special functions. As we have repeatedly said in the past, the railroad clubs make life distinctly harder for the railroad journal. Men who used to find practically their only avenue of communication with other railroad men through their favorite journal now read papers and discuss in the clubs. Thus a good deal of valuable copy only gets to the desk of the editor at second-hand, after it has been printed in the club pamphlets. Furthermore, these club pamphlets cut up the advertising field to some extent. Nevertheless, we have long said, further, that we have no doubt that in the long run the increased intellectual activity among railroad men because of these clubs will add to the number of intelligent readers of good journals, and so the final effect will be to raise the quality of the railroad journals and also to add to their prosperity.

Locomotive Boiler Pressures.

A Scotchman, writing lately of boiler pressures, says: "As to steam pressure, I can only say that we lag far behind in this; our average may be called 180 lbs., with occasional excursions to 200 lbs., and I think the new L. N. W. R. compounds have about 210 lbs.; 210 to 215 lbs. are becoming quite common for simple locomotives in the United States, while there and on the Continent hundreds of compounds range between 225 and 230 lbs."

We judge that our enthusiastic friend has been a little misled as to American practice. To say that a pressure of 210 to 215 lbs. is becoming common for simple engines in the United States is misleading. It is true that some locomotives were built last year for the Pennsylvania Lines West of Pittsburgh which carry 225 lbs. These are 10-wheel simple engines for heavy and fast passenger service. It is also true that the Class F3-moguls of the Pennsylvania Railroad carry 205 lbs., these also being simple engines. So far as we remember, these are the only instances in the United States of simple engines carrying upwards of 200 lbs. pressure, but practice seems to be drifting towards that as the upper limit, and a good many simple engines now carry 200 lbs. Yet it is doubted by able and experienced locomotive designers if it is desirable to go above 190.

Of course, 200 lbs. is a common pressure for compound locomotives in this country; indeed we should suppose much the most common. But there is an obvious tendency to push this pressure up. For instance, the Atlantic type passenger engines recently built for the Philadelphia & Reading carry 225 lbs., as do the tandem compounds recently sent to the Northern Pacific, while a large lot of tandem compounds now building for the Atchison, Topeka & Santa Fe carry 210 lbs. We remember no locomotive in this country, compound or simple, designed to carry over 225 lbs., and a boiler pressure of between 220 and 225 is certainly far from common practice in this country, and 200 lbs. may be taken as the standard practice even for compounds.

In all of this we do not forget that the Purdue locomotive "Schenectady No. 2," built for experimental purposes, has a boiler designed to carry 250 lbs. As is well known, this engine is not used on the road, although it is a road engine.

Freight Rates on Flour for Export.

The millers of the central west who for several years have complained that export freight rates on flour are too high, have taken their grievance to President Roosevelt, hoping that he will notice their demands in his message to Congress a month hence. They have also stated their case to the daily newspapers, asserting that if they could have a fair chance at the European market for flour they would increase the business of this country seventy millions of dollars yearly. They hope that this figure is large enough to interest the general public, and thus create a widespread sentiment in favor of Congressional action to compel the railroads to make lower rates.

The specific ground of complaint is that wheat in bulk is carried so much more cheaply than flour (which goes in sacks) that European millers have an advantage which American millers cannot overcome. The trouble is as bad, and worse, in lake and ocean transportation than in that by railroad, but there is no law by which to reach the water carriers, and so the only hope of getting a change in the through rates is to go for the railroads. It is claimed that wheat usually goes to England for from three to ten cents a hundred pounds cheaper than the lowest rate that can be got or flour.

It must be that these millers want an act of Congress arbitrarily requiring the railroads to carry flour for the same prices at which they carry wheat; for nothing less than a legislative act will accomplish what is desired. If the complainants have carefully read the Interstate Commerce Commission's discussion of the question (Aug. 7, 1899, I. C. C. Reports, vol. 8, page 214) they must be convinced that no administrative or judicial body, exercising a normal judgment, could ever give them satisfaction.

The problem would be too complex. The Commissioners did, indeed, decide that the flour rate ought not to be more than two cents higher than the wheat rate (and they *thought* that the railroads would be wise to make the rates exactly the same), but what would be the result of enforcing such a decision? All competent observers seem to agree that the export rates on both flour and wheat have been forced down to their present levels by the severest competition; and as this process has now been going on for several years it seems fair to assume that on both commodities the rates have got down close to cost; and it is therefore probable that if there is a difference between the rates it is based in considerable part at least on the ground of a difference in the cost of the service. If the profit of carriage is very small, a government decree could not disturb it much without wiping it out, entirely. To reduce the flour rate to the basis of the wheat rate would be confiscation of the railroad's property. To raise the wheat rate would be to check or stop the movement of the wheat. It is true that the railroads formerly for some time carried the two commodities at the same rate, but the fact that they wasted their money in 1897 is no warrant for distributing it to the millers by statute in 1901.

The most specific thing asked for by the millers is the passage of the Cullom bill, which has been before Congress nearly four years. This bill covers the whole field of rate making, and if enacted, would give the Interstate Commerce Commission power to prescribe rates (on all freight) for the future, and would give it better means of enforcing its orders. There is some sentiment among other classes of shippers in favor of the passage of a law of this kind, and the millers would, of course, like to have the cooperation of as many large business interests as they can get. But the history of the Cullom bill does not encourage the notion that it can be passed. Besides the opposition of most or all of the railroads there seems to be a considerable body of conservative sentiment which, while feeling full sympathy with the aims of the promoters of the bill, fears to enact a law making such radical and sweeping changes. Congressmen are coming to see more clearly that the existence of the anti-trust law, and the imprisonment clause of the Interstate Commerce law are the most tangible obstacles which at present prevent improvement in the status of the freight-rate question, and, therefore, they are unable to work up any enthusiasm for the Cullom bill. Moreover the bill is made up of such a large number and variety of subtle phrases that it requires a good deal of study before it can be understood; this must prove a great disadvantage in trying to get intelligent support for it.

If the millers, either with or without the help of Congress, are going to attack their own problem by itself they have before them a lot of very hard facts to deal with. The water carriers will show them differences in cost of service which no one has yet been able to neutralize. From Duluth or Chicago to the Atlantic seaboard the gross volume of bulk grain must always be much larger than that of flour, because it includes corn and oats, as well as wheat. This makes it economical (profitable) to provide more facilities for the bulk traffic, and more facilities means sharper competition. Cost of handling, care of bags or cooperage of barrels, greater risk of damage by wetting, etc., affect the rate in every case. These may be very small items, yet they have a constant effect. Ocean vessels carrying miscellaneous merchandise from Atlantic ports almost always want some grain to fill out their loads. This is one of the most powerful factors in keeping down rates from New York. From New Orleans and Galveston it is said that the warm climate increases the risk on flour much more than on wheat. Even if there be but little flour offered for shipment to Europe by way of the Gulf, the movement of wheat that way helps to keep down wheat rates by the northern routes. It is impossible to see how Congress can do anything to affect ocean rates, or how, if it could affect them, there could be any certainty of treating all interests fairly.

In most of the factors of cheapness which are due to the action of the wholesale principle, the railroads will show the same arguments in favor of lower rates for bulk freight as are presented by the vesselmen. Train loads are somewhat cheaper and more convenient to deal with than carloads, or even half-train loads. This difference may be small, and often hard to mathematically demonstrate, but there is no doubt of its effect. And a shipper urgent for a low rate, or a soliciting agent who is urgent for a large volume of business, will press his arguments or "influences" more persistently for a large transaction than when he has a smaller amount at stake; this fact cannot be ignored, for it is a commercial element which in free competition always has to be dealt with. The flour men have asserted, we believe, that export flour in sacks goes in such uniformly full carloads that it can be handled by the railroads with substantially the same measure of economy as bulk wheat; but from what the railroad men say we judge that this is true only to a very limited extent; perhaps only from Minneapolis to Duluth, where the total movement is very large. It appears, by the way, that the Minneapolis millers are not a party to the present movement on Washington.

But why should the millers, or President Roosevelt, or any one else waste time in discussing a proposition to change freight rates if the officers of the law are unable to devise any means of compelling the railroads to obey an order for a change when it is issued? It is a matter of common report —a subject of comment in the Chicago press despatches about every week—that export freight is constantly carried at secret rates; in other words, that nearly or quite all the railroads disobey the law. There is no use in ordering flour rates reduced to the basis of those for wheat if, the next day, the carriers are going to reduce wheat to any secret figure they please; nor if, by compelling a very low rate on flour, the profit on the combined business is made so low as to compel the railroads to raise the rates on wheat, and thus check its sale. It seems to us that the best thing that millers, or shippers of any

kind of freight, can do for the betterment of the freight-rate situation, is to work for the abolition of the imprisonment clause of the present statute. With that abolished freight agents might testify against other agents who break the law, whereas now it is almost always impossible to get evidence of secret rates. The abolition of this law should be accomplished by the enactment of a law to punish the railroad company instead of the individual agent when rates are wrongfully cut.

One of the most significant things said by Commissioner Prouty in the decision on the flour-rate question in 1899 was that—

"We are not here settling national or railroad policy [though low rates on export flour would tend to develop the industries of the United States]. We are simply administering the act to regulate commerce; and in view of all conditions as we find them, we do not feel that charging a somewhat higher rates on flour than on wheat for export is in violation of that statute."

It is all well enough for millers to appeal to the President of the United States for protection against European competition; but their true course is to demand an export duty on wheat! In trying to secure their object by readjusting freight rates, they are in substance asking the railroads to carry flour at rates which do not yield a fair profit. This is taxation; and if flour milling is to be fostered by imposing a tax, the burden should be laid on the whole people; not on the few railroads which lead to the Atlantic seaboard.

Annual Reports.

Great Northern.—For the first time in a number of years the annual report of this company shows a decrease in revenues, both in the aggregate and on a mileage basis. This loss is attributed to the short spring wheat harvest in 1900, which was most serious in the rich Red River Valley of Minnesota and North Dakota, peculiarly a Great Northern territory, and that company lost more heavily than any other railroad. President Hill speaks very definitely as to the extent of the loss in revenues and tonnage, because of the crop failure. The direct loss in movement of wheat and flax in the year he places at 31,864,000 bushels, and this follows a loss of over 1,000,000 bushels of wheat in 1900, but an increase of 16,000,000 bushels, or 480,000 tons, was reported in the previous year. Loss of revenue from the smaller movement of wheat and flax in 1901 he places at $2,897,747.

Most of this dimunition in wheat revenues was made up in other tonnage, particularly by the remarkable development of traffic on the Pacific coast divisions. Thus, the decrease in freight revenue on all the Great Northern rail lines, that is, on an average of 5,203 miles of operated road in 1901 (an increase of 126 miles in the year) was but $909,366 last year. There was an increase of $136,652 in earnings from the Eastern Minnesota Railway's iron ore traffic and of $1,851,730 in earnings from freight traffic other than wheat, flax and iron ore. There was also an increase in passenger traffic, but not a very large one, so that gross receipts for the year on the rail system decreased by $560,100. Operating expenses increased by $966,000, all departments showing an increase, though $629,000 of this amount was in transportation account. The summary of income for the system, for all the rail lines operated, except the Spokane Falls & Northern, is shown below:

	1901.	1900.	1899.
Miles worked	5,202	5,076	4,786
Freight earnings	$26,623,654	$22,533,020	$19,779,209
Passenger earnings	4,909,333	4,652,091	3,750,339
Gross earnings	28,350,690	28,910,789	25,017,904
Transport. expenses	7,751,339	7,122,817	5,989,018
Maint. equipment	2,354,311	2,114,408	1,595,188
Maint. of way	4,402,157	4,330,359	3,478,925
General expenses	1,335,613	1,309,993	1,100,871
Taxes	969,642	990,798	927,359
Oper. exp. and taxes	$16,813,063	$15,868,376	$13,091,361
Net operating income	11,537,626	13,042,413	11,926,542
P. c. oper. exp. to gross	55.88	51.46	48.62
P. c. exp. and taxes to gross	59.30	54.89	52.33
Miscell. income	1,583,027	2,131,150	915,420
Total net income	$13,120,654	$15,173,563	$12,876,962

This is the system for which the company's traffic statistics are reported. The earnings of the Northern Steamship Co., $1,034,111, in 1901, and of other controlled lines, would bring total gross revenues up to $30,564,387, and total net income to $13,887,680.

The revenue account of the Great Northern proper, that is, the Manitoba leased lines and the Seattle & Montana, shows heavier losses in gross and net earnings than the combined totals of the system, freight revenues falling off by $1,278,000, gross earnings by $1,072,000, and net receipts by $1,504,000. The operating revenues, as well as other items of income account, which include receipts turned over to the Great Northern from proprietary lines whose gross and net incomes are included in the statement above, were as below for three years:

	1901.	1900.	1899.
Freight earnings	$15,367,999	$16,645,519	$14,657,484
Passenger earnings	3,943,927	3,795,557	3,068,966
Gross earnings	20,881,057	21,953,412	19,057,814
Operating expenses	12,108,957	11,648,432	9,396,648
Oper. exp. and taxes	12,854,181	12,422,636	10,155,589
Net operating income	8,026,871	9,530,776	8,902,225
Net rentals	3,687,656	3,709,548	4,137,824
Net income	$4,339,215	$5,821,228	$4,764,401
Miscellaneous income	4,247,219	4,605,314	2,673,825
Total income	8,586,434	10,426,542	7,438,226
Dividends	6,897,369	6,408,778	3,851,034
Improvement fund	1,689,065	1,800,000	1,800,000
Surplus		$2,217,764	$1,787,192

Thus, in 1901, the entire surplus after dividends was appropriated for improvements.

Total revenue ton-miles decreased by twenty-three millions, or nearly 1 per cent., and average rates per ton-mile decreased by 3 per cent. from 8.99 mills to 8.71 mills. On the ton mileage hauled during the year this reduction amounted to about $695,000. While the ton-mileage was reduced less than 1 per cent. mileage of loaded freight cars was reduced 1.11 per cent., of empty freight cars 12 per cent., and mileage of freight trains 7.2 per cent., resulting in an increase of 24.5 tons (6.87 per cent.) in average revenue tons per freight train mile, making average train load 381 tons.

The dividends paid amounted to 7 per cent., the same rate as in the previous year, and 6¾ per cent. in 1899, but on a larger capital. The increase of $25,000,000 in capital stock in the year was announced last March, approved in April and later offered for subscription at par to the stockholders, when the shares were selling at a premium of about $90 per share. The current report states that this new stock was issued as of Aug. 1 last, and therefore no part of it is taken into the 1901 accounts, other than that the balance sheet carries an item of $8,358,700 on account of subscription receipts from stockholders to these new shares. The proceeds of this new capital are for the purpose of acquiring securities to an amount of not less than $25,000,000 of the Manitoba Railway, of the Great Northern Steamship Company (which is building two immense ships at New London, Conn.), and the stock of a number of smaller companies, which have built branches or extensions of the Great Northern lines, principally in Washington and Montana.

Some of these lines are still under construction, together with other new mileage not yet taken into account.

As is usual in the Great Northern reports, a very extensive review of the improvements is given by President Hill, and the list is much too long for an adequate summary to appear. A few instances of the revision of lines may be given to show the character of much other work.

Between the summit of the Rocky Mountains and Havre, Mont., 41.7 miles of new in place of 42.88 miles of old line, reducing the maximum grade from 1 per cent to eight-tenths of 1 per cent., and materially reducing curvature. Between Teton and Tunis, Mont., 16.65 miles of new in place of 13 miles of old line, reducing grades from $2^2/_{10}$ per cent. to $^6/_{10}$ of 1 per cent., besides reducing curvature. Between Wickes Tunnel and Boulder, Mont., 9 miles of new in place of 9.29 miles of old line, reducing grade from $2^2/_{10}$ per cent. to 1 per cent. A new line is being built from Belleville to Fairhaven, Wash., 18.9 miles, reducing the maximum grade from 2½ per cent. to ½ of 1 per cent.

Despite the loss in traffic in the year, additions to equipment were made on a large scale. Orders were placed for 60 locomotives and 62 passenger cars, of which none had been received when the fiscal year closed. Orders for new freight cars amounted to 2,300. In the previous year 40 locomotives, 33 passenger and 1,500 freight cars had been ordered and on account of these orders the company received in the last fiscal year 23 12-wheel locomotives and 1,500 freight cars, of which all but 200 40-ton flat cars were 100,000 lbs. capacity cars. Expenditures for equipment in the year, President Hill places at $1,720,571, of which amount $1,460,300 was capitalized. These amounts are exclusive of replacements, and Mr. Hill states that, as in previous years, only such amounts as represent cost of actual additions have been capitalized. Extraordinary expenses included in maintenance of way expenses for the year, he places at $1,236,205, and further points out that $1,898,879 for improvements on the Manitoba lines, which was capitalized in the accounts, has also been transferred to improvement fund.

Wisconsin Central.—The annual report of this company to June 30 is the second of the present company and serves as a reminder of how recently the period of railway liquidation in this country following the disasters beginning in 1893 has been passed. This property was in fact one of the forerunners of the long series of railroad bankruptcies then begun as it was also one of the last to pass out of the control of the receivers. Though the company is by no means a large one, operating 982 miles of road, of which 65 miles is trackage over other lines, and earning 5⅛ million dollars annually, it is an old system and has played an important part in the development of the Northwest. Indeed, the fact that it is a relatively old property bears in certain respects quite directly on the problems which it now has to face. That is, its geographical location was dictated less by considerations of through traffic between the West and the East, than by the desire to reach certain objective points furnishing special classes of traffic. Moreover, the lumber traffic, and the iron ore traffic of Northern Michigan, in the transportation of which the company has been an important factor, does not promise so well to the company as in other years.

In the past year revenue returns were disappointing, freight revenues falling off 7½ per cent. and the surplus over charges decreasing by half. Neither of these yearly returns equal those anticipated at the time of the reorganization in April, 1899, when it was estimated that the new company would be able to show net earnings of $659,000 with the improvements contemplated and provided for in the reorganization plan completed.

Failure to realize these net earnings, is due in part presumably to delays in completing improvement work contemplated, but also to the company's inability to secure or hold gross earnings which were relied upon. Last year's falling off in receipts was in part due to the short wheat crop in the Northwest, but in larger degree to decrease in iron ore tonnage. The company's chief reliance for freight is on the tonnage from the iron ore mines of Northern Wisconsin and Michigan. In 1900 over 1,468,000 tons out of 3,989,000 tons carried or 36¾ per cent. of the total traffic, was in iron ore. Nothing appears in the report to indicate the causes of the falling off in iron ore in a period when there was an almost unprecedented demand. It has been known during the year, however, that there was severe competition for this tonnage, the Chicago & North Western developing new active competition and new lines being built from the mines to give them short outlets to Lake Superior, whereas Wisconsin Central takes ore over a long haul through Wisconsin.

To offset this loss in gross receipts, expenses were decreased, the saving being $114,472, or $3^1/_8$ per cent., the decline in net earnings being thus $198,700. Larger taxes and interest, however, added about $60,000 to these losses.

Saving in expenses was wholly in maintenance account, and moreover, the company appropriated only $11,350 out of the surplus of $288,286 for betterments, whereas in the previous year $450,747 out of the surplus of $492,915 were set aside as an improvement fund. Reduced to a mileage basis, maintenance of way cost last year was $660, against $811 per mile in 1900.

Improvement work, however, continued during the year from funds furnished by capital issues. Construction account was charged with $891,948 for betterments, and for $906,000, including equipment charges, while cost of 10 freight locomotives, $120,000, was provided for by car trusts. In addition new capital was issued on other accounts, including the costs of the Marshfield & Southeastern railroad of about 33 miles. Cost of this was in part met by issues of stock, and treasury holdings of preferred shares show a decrease of $331,500, and in common stock of $1,533,980 par value. In addition $908,000 bonds were sold for improvements and a purchase money mortgage of $450,000 was issued on the Marshfield & Southeastern.

Figures of revenues and of traffic movement follow for two years:

	1901.	1900.	Decrease.
Average miles	955	945	*10
Gross earnings	$5,324,275	$5,637,416	$313,142
Operating expenses	3,466,463	3,580,936	114,472
P. C. to gross	65.1	63½	*1.6
Net earnings	$1,857,812	$2,056,480	$198,669
Total net income	1,878,731	2,064,758	186,027
Interest, taxes and rentals	1,632,614	1,571,843	*60,771
Surplus	$246,117	$492,915	$246,798
Improvements	11,350	450,747	439,397
Balance	$234,767	$42,168	*$192,599
Tons moved	3,428,562	3,989,032	560,470
Passengers carried	980,890	1,022,109	41,219
Ton-miles	522,867,887	571,086,238	48,218,351
Passenger-miles	54,134,195	55,531,569	1,397,374
Ton-mile rate	.742c	.731c	*11
Passenger-mile rate	2.08c	2.03c	*.05c
Freight train miles	2,027,951	2,212,702	184,751
Passenger train miles	1,668,896	1,765,574	96,678
Freight train load	260	258	*2

*Increase.

An English journal prints a complaint from the Earl of Dysart, in which he says: "Perhaps some of your legal readers would be in a position to inform the public as to how far it is possible to make good any claim for damages against a railway company arising from loss or expenditure incurred by reason of proposed alterations in the times of service not having been advertised in such a manner as to leave no reasonable possibility of travelers being unaware of them." The occasion of this ireful, litigious mood, says *Herapath's*, "was the non-obtaining of the Great Northern October time-table at a couple of country stations before the end of September. As a matter of fact, this railway company is commendably prompt in issuing its time-tables, but it is not easy to supply all stations at once. We make no claim for six and eightpence in informing his lordship that a railway company is not obliged by law to publish a time-table at all." We do not print this paragraph for the sake of giving to our readers an example of the latest King's English, though both the Earl and the editor have wandered away from the masters who wrote in the Victorian era. We merely desire to call attention to the fact that earls have their troubles, like the rest of us; and to the condescension with which the London journal notices the grievances of the nobility at small stations in the country. But we cannot regard the editor's defense of the railroad as powerful. The fact that it is "not easy" to get out time-tables in season for the needs of passengers may be an explanation, but it is not a reasonable excuse. No passenger agent would think of offering it to his general manager or president. If the law does not oblige railroads to publish time-tables, it is time for the law to be changed—unless, indeed, the circumstances are such that self-interest causes the railroads to properly serve the public without compulsion by law. In this country an enterprising passenger agent who finds that his new time-tables cannot be got through the printers' hands in good season issues a little "flyer" in advance, noting on it the principal changes that are to be made. As *Herapath's* has offered the earl one crumb of comfort, we will give him another: If he were in America he

would not have even the satisfaction of knowing that changes would in every case be made on the first day of the month. The railroads here change the trains whenever a change seems desirable; and the fact that changes have lately been made on all the divisions of a given railroad is no assurance that further changes are not to be expected for two or three months; a second change may be announced within two or three weeks.

The De Laval Steam Turbine.

In 1883 De Laval made his first successful steam turbine, using it in direct connection with the shaft of the well known cream separator manufactured in this country by the De Laval Separator Company. This turbine, in design and construction a reaction wheel was, however, soon replaced by one of the Branca type, and Prof. Thurston says: "The result was an astonishing efficiency, and the Branca form, particularly, exhibited such satisfactory qualities as constructed by De Laval for this use as to make it a permanent and standard addition to our list of prime movers."

However, satisfactory as these results were, the steam turbine was yet very limited in its application and comparatively wasteful of steam, and to successfully compete with the reciprocating steam engine, it was necessary to introduce means for the complete expansion of the steam. Should the true Branca type be retained, which was desirable on account of its simplicity, as compared with a combination of the Branca and Hero types, the constructive difficulties arising out of the high speed would have to be overcome. This De Laval aimed at and accomplished by the use of the diverging nozzle, which secured a complete and adiabatic expansion of the steam and the conversion of its entire static energy into kinetic. To overcome the impossibility of producing a wheel accurately enough balanced to revolve about its center of gravity at a velocity sometimes as high as 1,350 ft. a second, without causing a side pressure destructive to plain bearings and a rigid shaft, he produced a flexible shaft which (and the diverging nozzle) he patented.

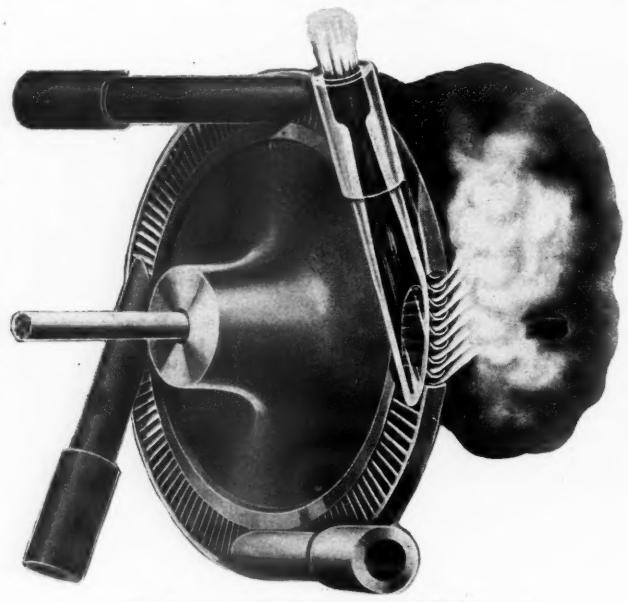
The De Laval nozzle and the flexible shaft are remarkable inventions in steam engineering. With the advent of the diverging nozzle and the flexible shaft the turbine has steadily progressed, thousands of machines in sizes from 3 h.p. to 300 h.p. having been built up to the present time, and outside of the United States De Laval steam turbine companies are operating in Sweden, Germany, France and England.

In a properly constructed nozzle, a volume of steam of maximum pressure (as every element of the nozzle assumes a temperature constant and equal to that of the passing steam) adiabatically expands to minimum pressure, and as this pressure is that of the surrounding medium, the steam at the point of discharge issues in a solid jet without tendency of its particles to divert in any direction.

Through numerous experiments Prof. Zenner has shown that theoretically the work of this adiabatic expansion converts the entire static energy of the steam into kinetic, and that the stored energy of a jet of steam issuing from the nozzle is identical with the work produced if an equal volume of steam is allowed to adiabatically expand behind the piston of a cylinder and at the same ratio of expansion—the diagram ending in a point.

fore it reaches the turbine wheel. The restriction as to the steam pressure that can be used is only with the boiler, and the turbine has been operated successfully with 3,000 lbs. per sq. in. Considerable increase in economy can be attained by using superheated steam, for which the turbine is well adapted, having no rubbing parts requiring lubrication, or packing glands in contact with the superheated steam, and, as with pressures, the limit depends on the boilers.

The speed regulation is unexcelled. The high speed, the simple and direct connection of the governing mechanism, and the exceedingly sensitive governor insure a perfect and safe control of speed, at the same time keeping the variation within small limits. The value of this cannot be over-estimated, especially where a machine is

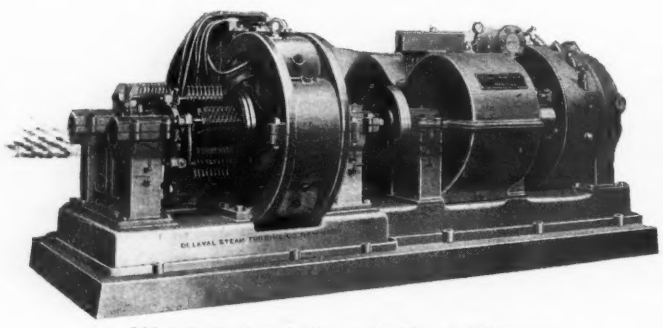


The De Laval Turbine Wheel and Nozzles.

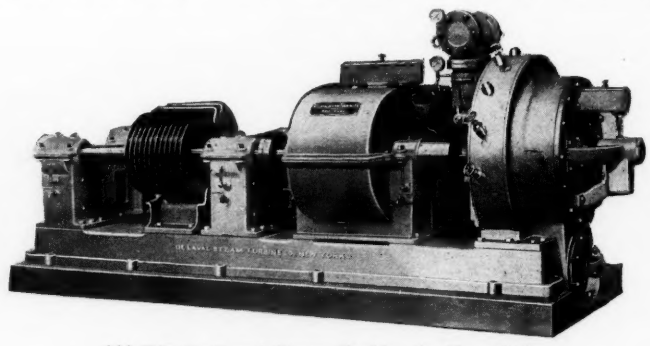
used for driving electrical apparatus. This turbine is particularly adapted for operating alternating machines in parallel, as there is an entire absence of variation in angular velocity which is responsible for so much trouble with reciprocating engines. The absence of reciprocating motion and the light weight and perfect balance of all revolving parts removes the necessity of foundations, except such as are required to sustain the weight of the larger-sized machines, and as this is much less than the weight of reciprocating engines of the same capacity the saving in cost of foundations is an important item. Turbines of any size may be placed in the upper stories of high buildings without any preparation except strength enough to sustain the dead load.

There is no danger from water being carried over into the motor as there are no valves and no clearance spaces where damage could result, the only effect of a large body of water being a slight slowing down of the wheel until it is disposed of. It is well, however, in all cases to use a separator as wet steam decreases the efficiency of the turbine. Experience extending over eight years, during which time there have been put on the market from the European factories upwards of 4,000 steam turbines, has demonstrated that the wear in every case is much less than any reciprocating engine. Some of these machines have operated during the entire time with practically no repairs, and at the most it has been only a matter of renewing some interchangeable babbitt bearings which can be removed or replaced without lifting the turbine shaft or the gear shaft from its position.

High speed is not objectionable in the turbine; the parts being so small, so perfectly balanced, and so well lubricated, are more durable than those of even a slow-moving reciprocating engine. The speeds used in the De Laval turbine are common in other lines of work where the conditions are more severe than with the turbine. The De Laval Separator Company has, during the last 20 years, put on the market over 250,000 centrifugal cream separators, which are running at speeds once considered absolutely out of the question, and these have been placed in operation on farms and in creameries where they are handled by the cheapest class of help, and oftentimes with practically no attention and almost no repairs. In addition to these many thousands of other makes have been sold and are in operation every day at speeds varying from 6,000 to 25,000 r.p.m. They are set up with poor foundations, or none at all, and in a number of cases where care is not taken with the engine governor the speed exceeds these figures.



300 H.P. De Laval Steam Turbine and Dynamo.



300 H.P. De Laval Steam Turbine for Rope-Drive.

The importance of a high steam pressure and a good vacuum when operating the steam turbine are recognized. Not that the steam turbine cannot, as far as the mechanical results are concerned, be operated equally well with low pressures and non-condensing, and even then successfully compete with the reciprocating engine, but whenever the best economy in operating is sought, high pressures and a condenser should be used, and as the difference and gain in economy in the case of the steam turbine is more marked than in the reciprocating engine it will be found in many cases, even for comparatively small sizes, of advantage to operate condensing, even in places where the scarcity of water would render the employment of a cooling tower necessary.

A characteristic of this steam turbine is that none of its running parts are subject to the full pressure of the steam, as the steam is fully expanded in the nozzles be-

Double-Heading With Heavy Engines.

A committee of the Central Railway Club reported on this subject at the September meeting as follows:

Investigation made by the committee has satisfied the members that it is not good practice to double-head trains with heavy engines; that it is good practice and a source of economy to double-head trains with the lighter type of engines under the following restrictions:

1. That no train should exceed 90 empty cars or 75 loaded cars.

2. That the heavy capacity cars be placed in the head end of the train to relieve the lighter capacity or old-type of cars from the excessive strains they would be subjected to unless they are placed in the rear end of the train.

3. That in starting a train with double-headers, the lead engine should start the train or take up all of the slack before the rear engine starts to work steam, thus avoiding unnecessary shocks to the equipment and the draft rigging in particular.

4. That the air-brakes should not be used in backing up long trains, but that the train should be held by hand-brakes from the rear end, as at the present time very few trains of this length would be equipped with air throughout, and the sudden stoppage of the front end of train would cause the slack to run out, in most cases parting the train either by the breaking of knuckles or knuckle pins, and in some cases pulling out ends of old cars.

Another reason why your committee is in favor of the double-heading of the lighter power is that the heavy type of engines put into service the last two or three years will more than equal two of the engines of the older types; for instance—the drawbar pull of engines built six or eight years ago averaged from 15,000 to 17,000 lbs., and the heavy engines recently built and now building have a drawbar pull of 36,000 to 40,000 lbs., and it would be inconsistent for us to say that you could not haul the same tonnage with two engines that you could haul with one.

We would urge that particular attention be paid to the draft gear, as the business of the country is continually on the increase, also competition, and the draft gear is put to a severer test than in the past. It is true that a large number of our old cars are being destroyed on account of the severe strains they are subjected to, but the saving of time and the quick despatch of freight, more than offsets the cost of repairing or replacing these old cars.

On investigating this subject your committee learned that on one of the roads where it was the practice to run trains with single engines over a division of 200 or more miles, they were running so many trains that the management was considering the advisability of cutting the division in two and putting in another set of despatchers so as to be able to move the trains with greater despatch, avoid long delays, and save a great deal of overtime. It was, however, decided to try double-heading with some of the lighter engines, limiting the number of cars to 75 per train, which was done. The cost of the extra despatchers, about $300 per month, was saved. The overtime for train crews was reduced to such an extent that a saving of over $6,551 per month was made, with an increased tonnage of 20 per cent. By adopting the latter plan, not only the $6,551 per month was saved, but the cost of about 15 cabooses, the salaries of a number of new train crews, also several hundred dollars a month for yard crews at terminals. On this particular division for the month of June the cost of repairs to cars due to rough handling was $1,142.99, and due to wrecks was $1,433.88, but we do not believe that all of the wrecked cars could be charged to double heading. The transportation department claims a saving of about one-third of the train expense is effected by the practice of double-heading with a proportionate elimination of risk.

DISCUSSION.

Mr. Waitt.—Is not the matter of double-heading something that has got to be determined very largely by the local conditions? The destructive effect on light equipment will be just as much with double-heading as with the heavy power and the best they can do would

seemingly be to so arrange their rules of operation that the engines may be handled with co-operative effect, a result that I was speaking of before, and also so that the brakes may be controlled in a way that will give the greatest degree of safety. I question, in large yards, if the yardmasters would be very strongly in favor of going to the added expense and taking the time to switch out the light equipment to the rear of the trains. On some roads they are fortunate enough to be able to handle a certain restricted line of cars in fast freights and for that purpose take the better class of equipment and run the lighter class of equipment on the slower freight trains, and where they are so situated they can do a certain amount of separation of light and heavy equipment that undoubtedly is helpful in the end. There is one division on the New York Central where they have had, in the past, a somewhat peculiar practice in double-heading which is due entirely to local conditions, namely, placing the second engine five cars back of the first. That is done simply from the fact that the bridges are not heavy enough so that they feel willing to put two engines on the bridge at the same time and it makes the separation a matter of safety. I think possibly there is an open question in some cases where double-heading is practiced, whether it is economy, and whether the same or better results might not be obtained and greater economy in the end by separating the work of the engine into two trains, even though it took another caboose and train crew, and I think that on roads where double-heading is largely practiced, it is a question that it would be well to consider and not simply in a superficial way, but to get right down to the figures, as to what they can do double-heading and what they can do hauling their trains separately. I think sometimes, based on cases that have come to my notice, that double-heading is done, when a single engine with a pusher, at one or two difficult points where there is a short and steep grade, would avoid the double-heading and would make more engines available for general use on the road.

Mr. Hutchins.—In regard to trainmen assisting the engineer in handling the train it is customary in good practice, and it has been the instructions in backing up the train, to have a sufficient number of hand-brakes applied on the rear end so that in case the engineer made an emergency, or in case a hose should burst on the head end, the slack of the train wouldn't run out suddenly enough to pull out drawbars. But I do not know of any way that the trainmen could assist the engineer in handling the train while the train is moving forward.

It would be very bad practice to use hand-brakes on the rear end of a partially-equipped air-brake train; but, regarding the engine in the middle of the train, the quick action effect throughout the train depends largely on the manner in which the second engine is piped. A few years ago there was a double-header put on a passenger train on one of the roads in the East, and the engineer had occasion to use the emergency and failed to get the emergency action on the train. In testing afterwards they found it was impossible to get quick action on this train from the head engine. They disconnected the engines and reversed their position, and still they failed to get quick action, but by making the application from the engine that was connected directly with the train, there was no trouble to get it. On investigation it was found that the engines had 14 elbows in the piping. When we consider the frictional resistance to the flow of air in an elbow to be something equal to about 15 ft. of straight pipe, we can readily assign the reason for not getting quick action. The piping was removed from the engines and it was put back with, I think, four elbows and another test made, and there was no trouble to get the quick action.

Mr. Sullivan (Illinois Central).—Mr. President, I have listened to what has been said with a great deal of interest, and in the presence of those who are so skilled in the mechanical phase of this work I hardly feel like saying anything on the subject. There is one point, however, I would like to refer to in connection with the second conclusion of your committee's report. From a transportation point of view such an arrangement is not practicable, except in yards where trains are made up and then only on through trains that will run over a district or division without having to do any work. But it is not often that trains can be so run, for while they may not have any local work to do, there is always more or less interchange business at junctions with other roads that has to go forward in through trains, so that on very long trains, with light capacity cars on behind, it becomes very slow and risky work to switch from the rear end, and is, therefore, disadvantageous; so much so that on many schedules where time is short, cars have to be switched into the train just as they come and take the chances of the light cars being able to stand the stress of the service. A great many of them are not doing that. The road I am connected with faced that question by deliberately destroying a great many of its light cars. One year we burned up 2,000 box cars of 15 tons capacity in order to get them out of the way. We couldn't stand it having them breaking down and collapsing and endangering all the other cars in the train; the risk was too great and we figured it out that it was an economical proposition to dispose of them in that way.

The question of running double-headers I hardly think is one that can be considered settled. There are more points to it than the mechanical conditions of the service. The test of the question is, next to its economy, the efficiency of the service. For instance, if a double-headed train will get a given number of loads over the road quicker as well as with less expense, then I think it can be said to be good practice, and if that can be done generally, it may be said to be good established practice; but it is very doubtful if that point has been reached. For example, I know of an instance where two large engines were double-headed because the Superintendent thought he could make a better showing by double-heading two large engines than he could by double-heading two small engines, and in the course of the trip they came to a coaling station where each engine had to have 12 tons of coal; and while they had made very good time over the road, it took them about two hours to get away from that coaling station; and similarly at water stations that are not equipped with large-sized standpipes, it takes a long time to get water. Then, in side-tracking trains at meeting and passing points, it is not generally the case to find the sidings long enough to take one of those long trains along with another train in the opposite direction, and it is hardly safe nowadays, on lines of dense traffic, to count on only one train having to take the siding at a passing or meeting point.

While the economy of the saving of one train crew in moving double-headed trains must be admitted, there are offsets to that economy in the delays on the road, the consequent overtime, the damage that is done to cars in sawing trains out at meeting points where the siding is not long enough to clear the main line, the difficulty of handling the train over hilly portions of the road, the uncertainty of trains moving on orders to make meeting points on short time, and a variety of other conditions.

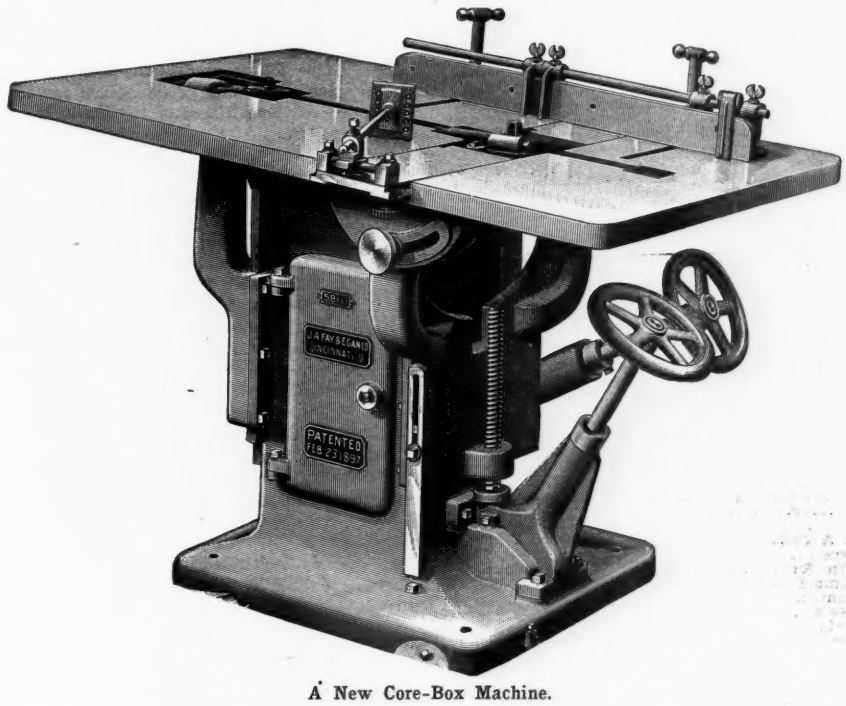
The same conditions precisely apply to the movement of trains with very large engines. I think the Illinois Central at one time had the two largest locomotives in existence. They were simple engines with cylinders 23 x 30; they carried 210 lbs. of steam, had 82-in. boilers, long fire-boxes, one a consolidation, the other a 12-wheel type. We were quite interested to know what this size of engine could do in the way of ultimate pulling capacity, so the order was given to start with a train of 1,500 tons on a run out of Chicago of about 50 miles, in the middle of which was the ruling grade of that district, about 24 ft. to the mile. Each day it made the trip increasing the trainload by 500 tons until the train got up to 3,500 tons, 82 loaded cars. There was no trouble in the engine handling the train, the trouble was to handle the engine.

This was about two years ago. We had two engineers and three firemen; that is, we had these men in reserve, and when we came to the heavy part of the hill the engine in its hardest pull made a mile and a half to a ton of coal and used up 5,000 gals. of water in running five miles. When it arrived at the station at the summit of the grade it had to cross over to the other track to let an important passenger train pass it, necessitating a short back-up movement to enter the cross-over track. In making this back and forward movement the train broke in two, eight or nine different times, on one occasion shearing under the head and under the nut 12 1-in. drawbar pocket bolts, so great was the power of the engine. Two hours and three-quarters was consumed in crossing over and getting back, and the train that it was intended to let by without causing any delay was delayed an hour and a half. We came to the conclusion that it was quite possible to get one engine that was large enough to handle a bigger train than was practicable, as a transportation proposition, to move over the road.

These large engines have now been in service nearly two years. We give them each trains of 1,800 tons on portions of the road where mogul engines of 19 x 26-in. cylinders handle trains of 900 tons. Each of the big engines takes a double train. The total expense of moving 10,000 tons one mile with the big engines is $1.86, as against $2.02 with the mogul. By reducing the train to a tonnage that could be handled readily, we have been able to operate the large engines successfully, having them take their turn in the service just as it comes—one day with a heavy coal train, next day with a stock train or with a banana train, making speeds anywhere up to 45 to 50 miles an hour, and do that without any trouble. We think that such an engine is, if anything, larger than economical locomotive practice demands, and have purchased no more of them. We find that a mogul engine with 20 x 28-in. cylinders, carrying 200 lbs. steam pressure, will take the same train over the road just as well as the engine with 23 x 30-in. cylinders. In other words, the 80-ton engine will do the work just as well as the engine which weighs 110 tons, and either of them will do better than a double-header.

A New Core-Box Machine.

The illustration shows a new core-box machine made by the J. A. Fay & Egan Co. It is known as their No. 42 machine, and the makers claim great advantages in speed and accuracy for making all kinds of cored boxes, and work that requires recessing and duplicating. The machine will cut semi-circular core-boxes of any length, and from 1 to 20 in. diam. Semi-circular core-boxes closed at the ends, with recesses of different diameters, can be made rapidly and with corners of any desired shape. On patterns with internal curves, such as the inside of staves, coves and cutting out the under side bosses to fit on rounded patterns, the work can be produced very rapidly. For making large fillets as on engine and pump frames, and similar patterns, it is unsurpassed and gives a great saving over the old methods of working the curve. Improved construction of the cutters gives knotty lumber, cut with or across the grain, a smooth surface. A radius attachment is furnished with the machine by the use of which circular core-boxes are correctly produced. The heads used may be set for different diameters, as the bits are adjustable; by this arrangement a fewer number of heads need be used to accomplish a wide range of work. Full particulars will be sent on application to the manufacturers.



A New Core-Box Machine.

Underground Telegraphs for Railroad Service.

At the September meeting of the Northwest Railway Club one of the papers was on "Telegraphy," by Mr. D McNicol, of the Minneapolis, St. Paul & Sault Ste Marie, who gave some of the reasons why the Morse telegraph is still supreme in this country, and promises to continue so.

The telephone has been in constant use for 25 years but has been little used by the railroads, except at terminals. This is due partly to the fact that all business sent by telegraph necessarily goes on record, but more perhaps because a railroad officer can send 10 telegrams in much less time than he can hold 10 different conversations. Again, a wire will transmit 400 messages a day more by telegraph than by telephone. Superintendents and telegraph superintendents continue very cautious about using the telephone for train orders. On roads of heavy traffic and high speed the train despatcher must be able to communicate quickly with any and every station, and he needs a trained person at each station. Therefore the telephone would be about as costly as the telegraph

The equipment of a telephone line costs much more than that of a telegraph line.

The automatic and printing telegraphs have not yet made any improvement on the Morse. The Wheatstone automatic appears to be losing ground, even in England. The advent of the typewriter has enabled the Morse telegraph to deliver messages in as good shape as automatic telegraphs, with less complicated and less expensive apparatus. Wireless telegraphy has made progress, but its sphere is limited because the speed of transmission is very slow; at all events its field will not conflict with that of the ordinary telegraph.

The Morse being still at the head, the telegraph engineer should aim to perfect it. The greatest obstacles to perfect service with lines on poles are the weather conditions. The remeedy for this is to put the wires underground, and this would seem to be the next great improvement to be expected. The problem is receiving serious attention in England and an underground cable has lately been put into use between London and Birmingham, 117 miles. This cable contains 7⁸ insulated copper wires in a lead sheath, which is enclosed in cast-iron socket piping made in sections of 450 ft. each. The cable is laid 4 ft. beneath the surface.

Putting wires underground would do away with a great amount of costly damage every year. Underground conduits should have a smooth interior and water-tight joints. The material of the conduit must be a non-conductor, non-inflammable and not subject to contraction or expansion. In Europe the practice in this art is better than ours. Cables are laid in trenches, not drawn in. The insulation is compressed paper, with which the conductor always remains in the center of the cable.

Standardizing Extra Heavy Pipe Flanges.

Last April a committee to take up this work was appointed by leading valve and fitting makers at a meeting in New York. The committee, of which Mr. J. C. Meloon, Mechanical Superintendent General Fire Extinguisher Co., Providence, R. I., was chairman, fixed upon the following schedule, which was adopted, effective Jan. 1, 1902:

Size pipe. Inches.	Diameter flange. Inches.	Thickness flange. Inches.	Diameter bolt circle. Inches.	No. bolts.	Size bolts. Inches.
2	6½	⅞	5	4	⅝
2½	7½	1	5⅞	4	¾
3	8¼	1⅛	6⅞	8	⅝
4	10	1¼	7⅞	8	¾
3½	9	1 3-16	7¼	8	⅝
4½	10½	1 5-16	8½	8	¾
5	11	1⅜	9¼	8	¾
6	12½	1 7-16	10⅝	12	¾
7	14	1½	11⅞	12	⅞
8	15	1⅝	13	12	⅞
9	16	1¾	14	12	⅞
10	17½	1⅞	15¼	16	⅞
12	20	2	17¾	16	⅞
14	22½	2⅛	20	20	⅞
15	23½	2 3-16	21	20	1
16	25	2¼	22½	20	1
18	27	2⅜	24½	24	1
20	29½	2½	26¾	24	1⅛
22	31½	2⅝	28¾	28	1⅛
24	34	2¾	31¼	28	1⅛

The following firms have agreed to adopt the standard:

The Eaton, Cole & Burnham Co.....Bridgeport, Conn.
Chapman Valve Manufacturing Co....Indian Orchard, Mass.
Walworth Manufacturing Co.....Boston, Mass.
Crane Co.....Chicago, Ill.
The Pratt & Cady Co.....Hartford, Conn.
Jenkins Bros.....New York City
General Fire Extinguisher Co.....Providence, R. I.
Builders' Iron Foundry.....Providence, R. I.
Jarecki Manufacturing Co.....Erie, Pa.
Crosby Steam Gage & Valve Co.....Boston, Mass.
The Kennedy Valve Mfg. Co.....New York City
The Ludlow Valve Mfg. Co.....Troy, N. Y.
The Lunkenheimer Co.....Cincinnati, Ohio
The Michigan Brass & Iron Works.....Detroit, Mich.
The Kelly & Jones Co.....New York City
Eastwood Wire Mfg. Co.....Belleville, N. J.
National Tube Co.....Pittsburgh, Pa.
Coffin Valve Co.....Boston, Mass.
Rensselaer Mfg. Co.....Troy, N. Y.
The Mason Regulator Co.....Boston, Mass.
McNab & Harlin Mfg. Co.....New York City
The John Davis Co.....Chicago, Ill.
Watson & McDaniel Co.....Philadelphia, Pa.
Ross Valve Co.....Troy, N. Y.
Edward P. Bates.....Syracuse, N. Y.

These firms will furnish to standard if desired by their customers:

Best Mfg. Co.....Pittsburg, Pa.
Pittsburg Valve, Foundry & Construction Co..Pittsburg, Pa.
Eddy Valve Co.....Waterford, N. Y.

The schedules will be printed by the Committee and copies can be obtained of the Secretary, J. F. O'Brien, P. O. Drawer No. 66, Station A, Hartford, Conn.

Ballast.

We have published in the last few months fairly complete accounts of the reports on the question of ballast which were presented at the Paris meeting of the International Railroad Congress, and particularly a long abstract of the valuable report made by Mr. Feldpauche, of the Pennsylvania Railroad. In the last issue of the *Bulletin* which we have received there is a full report of the discussion of the reports in the section, and the conclusions adopted are given. Some extracts from the discussion are printed below, together with the conclusions:

Mr. Bauchal.—Gentlemen, I do not insist on the second conclusion. It is a formula which cannot have any value, inasmuch as the experiments have not been made. Hence, I pass on to the third conclusion which now becomes the second:

"2. The resistance of the ballast to the lateral displacement of the track is very important. This resistance is due both to its mass and to friction. It seems to be much increased if the banks are widened or if a layer of ballast is placed on the sleepers. As a rule, however, it is advisable to adopt the English transverse section; i.e., to put little or no ballast on the sleepers and not pack their central portions. But in cases where conditions are not favorable it is possible to improve the stability of the line very materially by increasing the transverse section. The stability can be increased still further by various special methods."

Mr. Siegler.—I propose to modify this conclusion. This question of the resistance of the ballast to the lateral displacement of the track has frequently been discussed, and, as the Reporter has observed, it is a very important one. He proposes a series of conclusions to us, which it is advisable for us to consider from the practical point of view.

Some engineers think that in order that a track may have considerable resistance to lateral displacement it is necessary to have a considerable width of ballast and to cover up the whole sleeper with ballast. Others, particularly the English ones, think that the resistance to lateral displacement is due to the friction of the sleepers on the ballast on which they rest, and I think that the latter view is the correct one. The English engineers consequently think that it is advisable to put little or no ballast on the sleepers, and merely to pack it against their ends.

Now the conclusion which has been read out to us does not agree with these principles, and therefore I cannot support it. I, therefore, propose the following conclusion:

"2. The resistance of the ballast to the lateral displacement of the track is chiefly due to the friction between the sleepers and the ballast. It is advisable as a rule, to adopt the English practice, that is to say to put little or no ballast on the sleepers and merely to pack it against their ends, leaving the rail fastenings uncovered except in the case of tracks with double-headed rails, with wooden keys, in which case it may be advisable to cover the keys."

As you know, dryness tends to loosen the keys; hence, it may be advisable to cover them so as to protect them against heat. This point does not arise in the case of steel keys. As you see, gentlemen, my conclusion does not differ very much from that of our Reporter, but I avoid the possibility of drawing from it this false inference, that as the mass of the ballast contributes to the production of the stiffness of the track, it must be put everywhere, that is to say on the sleepers and on the ends.

Mr. Lefebvre (French Northern).—I, for myself, have made experiments in order to determine the superiority of a well-covered track, and I must admit that the advantages are hardly appreciable; they do not make up for the resulting increased cost of maintenance.

Mr. Lefebvre.—The difference between the lateral static resistance of our section and that of the English section scarcely amounts to half a ton.

Mr. Bauchal.—Could not Mr. Siegler leave out the sentence "except in the case of tracks with double-headed rails?"

Mr. Briere.—That sentence might be replaced by the following: "Putting ballast on the sleepers only produces a very slight increase in the stiffness. It is only necessary to adopt this method in special cases."

Although they have not made any experiments on the subject, the engineers of the Orleans railroad are strong supporters of the theory that on lines with many curves, run over by high-speed trains, there should be a thick layer of ballast at the ends of the sleepers. As a rule, we do not put any ballast on the sleepers between the rails, but we put as much as possible on the ends of the sleepers.

Mr. Bauchal.—I now beg to propose to you the following conclusion, in which the original first sentence is omitted:

"2. It is advisable, as a general rule, to adopt the English transverse section, that is, to put little or no ballast on the sleepers, and merely to pack it against their ends. But under unfavorable conditions the stability of the track may be increased by using a different cross section of ballast. Finally, further stability may be obtained by the use of sundry special methods."

Mr. Cartault.—I have to request that the English transverse section should not be recommended, but that the wide transverse section should be accepted.

Mr. Siegler.—Well then, leave out the words "to adopt the English transverse section," and we shall then agree. The first sentence will then be: "As a general rule, it is advisable to put little or no ballast on the sleepers and merely pack it against their ends." This will then be followed by: "But under unfavorable conditions, etc."

Mr. Bauchal.—I agree to this amendment.

The President.—The conclusion as amended is adopted.

Mr. Siegler.—I beg to propose the following conclusion, which appears to me to meet the views of everybody:

"5. In most cases, particularly with new lines, there is no choice, as different ballasts are not available; but there are also many cases in which several materials of different quality and price are available. Hard broken stone, which is not affected by frost, broken blast-furnace slag, and sharp angular gravel are the best ballasts for main lines. On well-laid out secondary lines, on the other hand, finer materials are preferable as they are more easy to use. Clinkers also make an excellent ballast. Coal cinders are to be reserved as much as possible for station and yard tracks and for private sidings. Gravel from pits or rivers, either wet or dry, is to be used, either as it is, or after being partially or wholly screened, according to circumstances."

The President.—I declare this conclusion adopted.

NEW PUBLICATIONS.

Cambria Steel. A Handbook of Information Relating to Structural Steel, etc. Philadelphia and Johnstown: Cambria Steel Co. 1901. $1.

The fifth edition of the handbook of the Cambria Steel Company has been recently issued. It contains all the data of the fourth edition corrected and revised. It also contains new matter, including drawings of new sections, with tables of their weights and properties. Other new matter includes drawings and tables of new connection angles for beams and channels, giving location and other data for sections of different depths framing opposite each other; tables of safe loads of various rolled and built-up members; tables of dimensions of Z-bar columns, latticed channel columns and plate and channel columns; tables of radii of gyration of two angles back to back; properties and principal dimensions of standard T-rails; information relating to grillage beams and drawings showing certain typical details of construction. The volume is a 12mo. of 428 pages, well printed and bound in flexible morocco.

The Nature and Meaning of Numbers. By Richard Dedekind. Chicago: The Open Court Publishing Co., 1901. 12mo., 115 pages. Price 75 cents.

Mathematical Essays and Recreations. By Hermann Schubert. Chicago: The Open Court Publishing Co. 1898. Octavo, 149 pages. Price 75 cents.

A number of the smaller works of German logicians, physicists and mathematicians have been translated into English and published by the above firm. Some of these, like the Essays of Prof. Schubert, will be of interest and value to a wide circle of engineers, as they present the important conclusions of modern mathematical research in a form easily read and comprehended. Others, like Prof. Dedekind's paper on numbers, are difficult for an engineer to read, as they were written for the profound mathematicians of some learned society. Every engineer knows something about the nature and meaning of numbers, but not one out of an hundred will be able to add to his knowledge by reading Dedekind's profound investigation. On the contrary 90 per cent. of the engineering profession would probably find suggestive and interesting information about numbers and the fourth dimension of space in the very clear writings of Schubert.

TRADE CATALOGUES.

Narrow Gage Material.—A 16-page pamphlet entitled "A Short Railway Story" is being sent out by Arthur Koppel, of 66-68 Broad street, New York. It is a treatise on narrow-gage railroad materials, which emphasizes the advantages to be derived from contracting for complete outfits with one firm. This pamphlet shows one or two designs in the leading lines of his manufacture, giving a general idea of the varied products manufactured by this firm. Any one interested in narrow gage railroads for mines or industrial plants will receive a copy on request.

TECHNICAL.

Manufacturing and Business.

Frank D. Laughlin has severed his connection with the Goodwin Car Co. His resignation was accepted on the 19th.

A. B. Crane & Co., Chicago, report a complete portable crushing plant on hand for sale and ready for delivery at Chicago; also noisting engines.

Contracts have been awarded by the Mohawk Valley Power Co., Gloversville, N. Y., for the equipment for their new power station near Tribes Hill, N. Y., as follows: Three 1,500-h.p. Vertical Cross compound engines, together with pumps, etc., to Allis-Chalmers Co.; for the electrical equipment, including three 1,000-k.w. generators, to the General Electric Co.; for battery of 10 boilers, aggregating about 5,500 h.p., together with the water tower and hot wells, to the Springfield Boiler Co.: for economizers, to the Bromell, Schmidt Co.

The Stanley Electric Mfg. Co. has opened offices in the New England Building, 129 Euclid avenue, Cleveland. Ohio, in charge of Alexander T. Moore, formerly of Pittsburgh, as district manager.

Paul S. Reeves & Son, Philadelphia, have received a gold medal from the Pan-American Exposition for their exhibit of brass and bronze castings and babbitt metals. It will be recalled that this concern received from the National Export Exposition, at Philadelphia, a silver medal (the highest award) for a similar exhibit.

Iron and Steel.

The Norway State Railroad is reported in the market for 9,512 tons of rails. with fish plates.

H. T. Gause has resigned as President of the Harlan & Hollingsworth Company, of Wilmington, Del.

William P. Hopkins, General Manager of the Slatington Rolling Mill, died in Allentown, Pa., Oct. 17, aged 69.

The Pennsylvania Car Wheel Company has broken ground for a new machine shop near its plant in Allegheny.

The Mahoning Foundry & Machine Co., Youngstown, Ohio, has let contracts and broken ground for a new machine shop and foundry.

W. T. Waddie, recently of the Mannesmann Tube Works, Ladore, Wales, will be Manager of the tube works to be built at Sault Ste. Marie, Ont.

The Pittsburgh Steel Co., Monessen, Pa., has let the contract for the structural work for its new wire and nail plant to the American Bridge Co. The plant will cost about $1,500,000.

The Youngstown Iron Sheet & Tube Co., Youngstown, Ohio, expects to have its sheet mills in operation in January. The tube mill will be started after the sheet mill is put in operation.

The Buffalo (N. Y.) plant of the Allis-Chalmers Company will be removed to Milwaukee, Wis., as soon as the Buffalo lease expires. The new plant at West Allis, Wis., is so far advanced that machinery will be installed within 60 days.

The following directors have been elected for the Crucible Steel Company of America: James H. Park, Reuben Miller, G. Bruce Harton, Alexander Thomas, William P. Snyder and Alexander W. Black. Messrs. Snyder and Black are new members, the former replacing William G. Park and the latter L. D. York.

The St. Clair Furnace Co. and the St. Clair Steel Co., constituent companies of the Crucible Steel Company of America, which are building three large blast furnaces and 12 50-ton open-hearth furnaces and blooming mill, expect to have these in operation within the next few months. These plants will make the Crucible Steel Co. absolutely independent as regards raw material of all kinds.

The stockholders of the Old Dominion Iron & Nail Works, Richmond, Va., have elected the following officers: G. V. Lewis, President; E. L. Bemiss, Vice-President; Arthur B. Clarke, Secretary and Treasurer; R. M. Blankenship, General Superintendent; Directors, G. V. Lewis, E. L. Bemiss, Arthur B. Clarke, R. M. Blankenship, J. William Middendorf, R. L. Williams, F. C. Todd, L. M. Williams and Fred E. Nolting.

The shipments of pig iron, steel and cast-iron from the Southern field in September were quite heavy. The total shipments from Tennessee and Alabama were 137,225 tons.

Officials of the United States Steel Corporation declare that the cut in the price of wire nails of 5 cents a keg by independent makers is not a surprise to them. They have no intention of retaliating. They claim they have a market for all the nails they can produce at the prevailing price of $2.20 a keg.

The Everson Steel Co. has been organized under the laws of West Virginia, with a capital of $3,000,000, and will build a plant in the Ohio Valley below Wheeling, where a new town will be located.

The railroads are arranging for next year's rail requirements which, it is estimated from the limited reports thus far made, will be large. The Illinois Central is said to have ordered 50,000 tons; the Wabash, 40,000 tons; and the Union Pacific, 100,000 tons. The Monon road has ordered 5,000 tons of 75-lb. rail for the southern end of its road. The Lake Shore is said to have ordered 85,000 tons from the U. S. Steel Corporation. The Pennsylvania will need about 165,000 tons tor 1902. The order last year was 150,000 tons at the pool price of $26 per ton. This year's price, it is said, will be $28. No allotment has as yet been made, though it is believed that it will probably be the same as heretofore, except that the order for the Carnegie Co. and the National Steel Co. will be given to the U. S. Steel Corporation.

The American Nut & Bolt Fastener Co. will be incorporated in Pennsylvania by Milton Bartley, S. E. Moore and Robert M. Hamilton. The company will build a factory in the vicinity of Pittsburgh to make a patent nut fastener.

The American Society Rail Committee.

Our latest information concerning the proposed committee on revision of the American Society rail section is that but 24 votes are lacking in order that the ballot may be canvassed. Perhaps this paragraph may catch the eye of some member who has not yet voted and suggest to him that he proceed at once to do his duty. In case he has forgotten all about the matter he can get the ballot form and any requisite information by writing to the Secretary.

Pneumatic Tool Patents.

We have received a letter which the Chicago Pneumatic Tool Company is sending out under date of Oct. 15, which refers to the decision of the United States Circuit Court in favor of the Moffet patent No. 369,120 on portable drilling machines. The company informs its many customers that it has become convinced that the Moffet patent is infringed by the portable power drills now manufactured, and that in order to protect its customers it has bought a license under this patent, thus protecting the drills which it has made and sold heretofore, or may make and sell hereafter.

A Visit to the Bethlehem Steel Company.

On Saturday, the 12th, a large party of the members of the American Street Railway Association and their friends and guests visited the works of the Bethlehem Steel Company. This company has had a good deal to do with the development of the electric railroad interest, particularly through forgings for power houses, and the party visiting the works took great interest in noting the processes of manufacture. Shafts and other forgings were seen in various stages. and especial attention was given to the process of fluid compression, wherein the mold is cooled under hydraulic pressure. The hydraulic forging presses were also objects of a great deal of interest. Examples were seen of heavy shafts of fluid-compressed steel, mandrel-forged hollow.

The Electrification of the Metropolitan Railroads of London.

Hon. Alfred Lyttleton, the arbitrator selected to decide on the system of electric traction to be adopted by the combined interests of the Metropolitan and Metropolitan District Railroads, held early in the month a preliminary meeting at the Board of Trade. No progress was made, however, as the Metropolitan Company was not ready to go on, and it was decided to open the evidence on the 29th of October. Three years have gone by since the Act was passed for the electrification of the Metropolitan and the companies have not yet come to an agreement as to the general principles of the scheme. Meantime, Mr. Yerkes has bought control of the Metropolitan District and is proceeding as fast as he can, but, of course, cannot go far without the agreement of the Metropolitan, as the trains must run freely over both properties. But the Metropolitan people have so far favored the Ganz system, while Mr. Yerkes insists upon the employment of a tried and proved system, contending with what seems to us accurate business sense that this great enterprise is one on which radical experiments cannot be tried. Meanwhile, important contracts have been awarded to the Westinghouse people for boilers, engines and generators for the power house of the Metropolitan District.

Air Cars for Chicago.

We described, a few weeks ago, in detail, with engravings, the improvements made in the motor cars of the Compressed Air Co. Two of these have been sent to Chicago for service on the North Chicago line, where compressed air cars have been in use for two years or more. The improved cars have been running for some time in Rome. It is hardly necessary to say that no accidents due to air pressure have occurred there or elsewhere. Indeed many engineers and mechanical experts pronounce them perhaps the best and safest means of conveying passenger traffic known, for the conditions to which they are especially adapted.

THE SCRAP HEAP.

Notes.

The *Four-Track News* says that on a dining car of the New York Central recently 318 dinners were served without re-stocking the car. The first dinner was served at noon; the hour at which the last one was eaten is not stated. The man in charge of the car was Mr. J. M. Diamond. The chef was William Slow, but we can readily believe the statement of the narrator, that the crew, as a whole, had nothing slow in its make-up.

At Reading, Pa., last week 70 conductors and motormen of street cars were arrested for violating the law in running cars on Sunday. When brought before an Alderman each man was fined $4 and costs, but when the cases came before Judge Endlish the suits were dismissed and the costs assessed on the prosecutors. The prosecutors, representing strikers, practically admitted that their object was not to stop the running of cars on Sunday, but to annoy the new men who had been employed to take charge of them.

The *Four-Track News* quotes a letter from a woman, who is supposed to have traveled over the New York Central, in which it is stated that the red-cap porters in the Grand Central Station at New York, who are appointed to carry to the waiting room or to the street the hand baggage of passengers alighting from incoming trains, receive about as much pay as "the average railroad conductor," or twice as much as porters usually receive. The inference to be drawn is that passengers can here get good service without feeling obliged to tip the porter.

The ferryboat "Elizabeth," of the Central Railroad of New Jersey, while making its 8 o'clock trip from New York to Communipaw on the morning of Oct. 22, caught fire and was destroyed. The passengers were landed in safety and the boat dragged out into midstream, where a score of tugs worked on her several hours and then towed her to Communipaw Flats, where she burned to the water's edge. The "Elizabeth" was one of the oldest boats on the line, but was practically rebuilt last year at a cost of $65,000.

Traffic Notes.

F. L. Rice, a notorious ticket scalper of Chicago, found guilty of dealing in forged tickets and out on bail, forfeited his bail of $10,000, by failing to appear in Judge Kavanagh's court, Oct. 14. It is said that the bondsman in the case was backed by contributions from ticket brokers.

The Railroad Commissioners of California have issued an order that from Nov. 1 the rate on oil from Bakersfield to San Francisco shall be reduced from 42 cents a barrel to 37.8 cents (10 per cent.). The distance is 314 miles. Commissioner Blackstock dissented from the decision, holding that no reduction should be made.

The increased rates on eastbound grain, which were agreed upon two months ago, went into effect Oct. 21. The rate on grain for domestic consumption, Chicago to New York, is 17½ cents per 100 lbs.; the export rate is 13 cents on wheat and corn and 15 cents on oats. It is said that a number of contracts at the old rates are still to be filled, the railroads having been unable to furnish cars enough to load, before Oct. 21, all the grain contracted for. The lake and rail rate on flour has been advanced to 14½ cents, Chicago to New York.

An Electric Railroad from London to Brighton.

The daily newspapers in London have been lately giving a good deal of space to a proposed electric express railroad to Brighton. The line will be 47 miles long, and it is proposed to run the distance in half an hour. The line, as laid down on paper, is practically straight, there being one curve with three miles radius and another with six miles radius. There is one grade of 1 per cent., which, however, is short. The particulars of the enterprise so far received are few and of little value, and we can form no judgment as to the probability of the project ever being carried out.

Increased Naval Estimates.

The estimates for the Navy for the fiscal year ending June 30, 1903, have been announced. The total amount is $98,910,894, against $77,924,535 for the current year. The chief increases are $2,600,000 for construction, $2,000,000 for armor and $129,355 in the appropriation for yards and docks. The estimate for new improvements at the New York Navy Yard aggregates $3,110,000.

Draining the Zuider Zee.

This project has been withdrawn from the States-General by the new Ministry, thus being disposed of probably for a long period. The state of the Dutch budget renders such an undertaking at this time unadvisable; besides, the fall in the price of land has diminished the demand for new agricultural holdings.

Electric and Railroad Development in Korea.

On the night of Aug. 17, the Seoul Electric Company formally opened its electric lighting plant, illuminating the city by arc and incandescent lights. This lighting plant is run in connection with the electric street railroad, the installation being of the polyphase direct-current alternating-current system. The Seoul Electric Company is a Korean concern, but the builders and operators are American—Messrs. Collbran & Bostwick—who hold the plant on mortgage until all indebtedness is paid. This is not the first electric plant to be erected in Korea. In 1886, an Edison incandescent plant was installed in the palace, and was successfully operated until the boilers were worn out. In 1894, a plant was erected by the American electrician of the Korean Government, Thomas W. Power, but the Japan-China war prevented its use long.

On Aug. 20, at Yong Dong Po, just across the river from Seoul, on the line of the Seoul-Chemulpo Railroad, work was begun in a formal manner upon the Seoul-Fusan Railroad. This road, for which a Japanese company holds the concession, is to be 280 miles long. It will connect Seoul with the southeastern port, and will pass through the rich agricultural region of Southern Korea. Persons wishing to communicate with the officers of the company in Korea may address the director, Mr. K. Takanouchi, Seoul, Korea, or Mr. Adachi, Chemulpo, Korea. It is expected that the road will be completed in six years. It will be of standard gage, and there will be considerable bridge work. It will be operated in connection with the Seoul-Chemulpo Railroad, over whose tracks and bridge the new road will enter Seoul. The Seoul-Chemulpo road, with a 10-span steel bridge, is of American construction and equipment.

A railroad to connect Seoul and the northwest border town, Weichu or Weiju, is being surveyed. This is to be built by French engineers, using French material. It will tap the coal and gold mining region and may at some time, if built, connect with Russian roads in Manchuria. Mr. G. Lefevre, lately secretary of the French legation in Seoul, is director of this road. His address is Seoul, Korea.

The St. Louis Fair.

The Committees of Arrangements for the Louisiana Purchase Exposition, the World's Fair which will be held in St. Louis, Mo., in 1903, have been organized. David R. Francis is President of the Exposition Company, and Walter B. Stevens, Secretary. The Committee on Transportation consists of Julius S. Walsh, as Chairman; Joseph Ramsey, Jr., Vice-Chairman, and S. M. Felton, B. F. Yoakum, Charles H. Turner, George W. Parker and A. A. Allen.

The Pullman Company.

The annual meeting of the Pullman Company was held in Chicago, Oct. 17, at which more than two-thirds of the capital stock was represented. The Directors elected were: Marshall Field, O. S. A. Sprague, Henry C. Hulbert, Henry R. Reed, Robert T. Lincoln, Norman S. Ream, William K. Vanderbilt, J. Pierpont Morgan, Frederick W. Vanderbilt, W. Seward Webb and Frank O. Lowden. There was declared, previous to the meeting, the usual quarterly dividend (No. 139) of $2 per share from the net earnings. The following annual statement was presented:

Total revenue		$17,996,781.99
Expenses of operation	$7,378,199.34	
Depreciation on cars and property	1,485,601.42	
Dividends	5,919,886.00	
Net earnings of cars paid associated interest	346,760.22	15,130,446.98
Net surplus		$2,866,335.01
Surplus brought forward		4,895,944.73
Surplus		$7,762,279.74
Capital stock		74,000,000.00
Net assets		81,762,279.74

The number of passengers carried during the year was 9,618,438, and the number of miles run was 335,742,267. During the previous year the number of passengers carried was 7,752,876, and the number of miles run was 274,066,488. The increase was largely due to 12 months' operation of Wagner territory, while the previous year included only seven months' operation of the same territory. The total mileage covered by contracts for the operation of this company's cars, is 165,283. The value of the manufactured product of the car works of the company for the year was $16,424,789, and of rentals $306,886, a total of $16,731,676, against $17,026,270 for the previous year. The average number of names on the pay rolls at Pullman for the year was 6,457, and wages paid $3,921,452.42, making an average of $607.32 for each person employed. The total number of persons in the employ of the company, in all departments, was 17,737, and the wages paid during the year was $9,514,534. The number of employees for the previous year was 16,066, and the wages paid during that year $8,483,132.

Fuel for Swedish Railroads.

Sweden imports yearly large quantities of coal and coke. This has caused the authorities to consider whether Sweden could be made more independent in this respect. It has been suggested that the State Railroads could get their motive power partly from waterfalls, and experiments will probably be made in this line. The managers of the State Railroads have been instructed to make trials of peat, peat charcoal, and peat briquettes as fuel for locomotives. The intention is to construct a special locomotive to be used in these experiments, and if they are successful other engines will undoubtedly be built, because peat is abundant in this country. The navy and the State Railroads have also tried to use Swedish coal, but without much success; the efforts will be continued, however. A Gothenburg newspaper reports as follows: "In the new briquette factory at Elmhult, belonging to the State, experiments will be made this fall in the production of a cheap and practical fuel for Swedish rail-

roads. In locomotive furnaces Swedish coal cannot be used alone, because it contains too much incombustible substance. It must therefore be mixed with English coal, but this is becoming more and more expensive."

LOCOMOTIVE BUILDING.

The Cincinnati, New Orleans & Texas Pacific is having two engines built by the Baldwin Locomotive Works.

The Grand Rapids & Indiana has ordered seven locomotives from the American Locomotive Co., to be built at Pittsburgh.

The Seaboard Air Line has given to the American Locomotive Co. a contract for the 16 locomotives referred to in our issue of Oct. 11. They will be built at Richmond.

The New Orleans & Northeastern (Queen & Crescent) has ordered three engines from the American Locomotive Co. They will be built at Richmond.

The Vandalia order with the Baldwin Locomotive Works, referred to last week, calls for five six-wheel switching engines, to weigh 123,700 lbs. They will have 19-in. x 26-in. cylinders; 50-in. driving wheels; straight boilers with 180 lbs. steam pressure, and 259 tubes 2 in. in diam. and 131 in. long; fire-boxes, 102 in. long and 33 in. wide; tender capacity, 7½ tons of coal. The special equipment will include Westinghouse brakes, Coffin process toughened steel axles, National Hollow brake-beams, Tower couplers, Leach sanding devices, Scott springs and Standard ties.

CAR BUILDING.

The Seaboard Air Line will build, at its Portsmouth shops, 500 flat cars.

The Minneapolis & St. Louis has ordered two chair cars from the Pullman Co.

The Pennsylvania Co. is reported as taking bids on a large number of freight cars.

The Southern Missouri & Arkansas has ordered one private car from the Pullman Co.

The Chicago, Milwaukee & St. Paul has ordered four sleeping cars from the Pullman Co.

Armour & Co. will build 100 refrigerator cars at its Chicago and 100 at its Kansas City works.

The Cumberland & Pennsylvania has ordered five freight cars from the South Baltimore Car Works.

The Duluth & Iron Range is in the market for 250 steel ore cars, of 100,000 lbs. capacity, and 25 box cars.

The St. Charles Refrigerator Despatch has ordered 100 refrigerator cars from the American Car & Foundry Co.

The American Car & Foundry Co. has orders from individual concerns for 55 miscellaneous freight and 11 tank cars.

The Chicago, Burlington & Quincy has ordered 1,000 coal cars, of 80,000 lbs. capacity, from the Illinois Car & Equipment Co.

The Chicago & North Western has ordered two dining, four parlor, four baggage and three mail cars and 20 coaches from the Pullman Co.

The Wabash has recently bought from the Rodger Ballast Car Co. 50 convertible ballast and coal cars. They are of 80,000 lbs. capacity and furnished with extra coal sides 3 ft. high.

The Ingoldsby Automatic Car Co., St. Louis, Mo., has received an order from the Colorado & Southern for 400 of its standard gage dump cars for coal and ore service. The cars will be of 80,000 lbs. capacity.

The Cold Blast Transportation Co. has ordered 100 refrigerator cars, of 60,000 lbs. capacity, from the American Car & Foundry Co., in addition to 300 recently ordered, as reported in our issue of Oct. 11. The cars will measure 34 ft. 6 in. long, 9 ft. 7 in. wide and 13 ft. high. The specifications include Pressed Steel bolsters, Westinghouse brakes, Janney couplers, Thornburgh draft rigging and Rigid (diamond) trucks.

The Pere Marquette order with the American Car & Foundry Co., referred to Oct. 11, calls for two combination smoking and baggage cars, six first-class coaches and two café and two parlor cars. They will all measure 70 ft. long over sills and be equipped with Westinghouse brakes, Fulton brasses, Gould couplers, Harrison dust guards, Gold heating system, acetylene light, Sherwin-Williams paint, Detroit springs and Chicago Railway Equipment Co.'s frictionless side bearings.

The Chicago, Rock Island & Pacific order with its Horton shops, referred to Oct. 18, calls for 100 box, 100 stock and 100 coal cars, all 60,000 lbs. capacity. The box cars will weigh 32,000 lbs. and measure 34 ft. 1 in. long, 9 ft. wide and 10 ft. 2 in. high; the stock cars will weigh 33,500 lbs. and measure 37 ft. 3 in. long and 9 ft. 4½ in. wide; the coal cars will weigh 28,600 lbs. and measure 36 ft. long and 8 ft. 6 in. wide. The specifications call for Westinghouse brakes, Janney couplers and Miner draft rigging.

BRIDGE BUILDING.

Bristol, Tenn.—A committee, consisting of George E. Boren, Wm. R. Allen and others has been appointed by the Carter County Court to make estimates on the cost of rebuilding five bridges in that county that were swept away by the May flood.

Brookhaven, N. Y.—The State Board of Railroad Commissioners have decided that an overhead crossing may be built over the Long Island R. R. tracks to eliminate the grade crossing of both the Dock Road and the Sills Path or Patchogue & Yaphank Road.

The Board has also granted permission for an undergrade crossing of the Long Island tracks on a highway known as Hawkins Road.

Cave-in-Rock, Ill.—According to report, the Illinois Central has surveyors at work to locate a place for a bridge to cross the Ohio River.

Clay, W. Va.—An election will be held in Clay County on Oct. 26, to decide on an issue of $27,000 of bonds for a new bridge over Elk River.

Cleveland, Ohio.—Bids will be received at the office of the Clerk of the Board of Control at the City Hall, until noon of Oct. 30, for rebuilding the bridge over the tracks of the Cleveland Terminal & Valley R. R., at Canal street. Chas. P. Salem, Director of Public Works.

Danbury, Conn.—The Danbury & Harlem Ry. is applying for permission to build a viaduct and several bridges.

Elizabeth, N. J.—The Board of Freeholders has decided to build new bridges on Crane and Price streets over Elizabeth River, each to cost about $12,000.

El Paso, Texas.—According to report, an El Paso electric railroad will build a bridge over the Rio Grande.

Fargo, N. Dak.—Bids are wanted, Nov. 12, according to report, for a 200-ft. steel bridge at North Pacific avenue. O. J. Olson, County Auditor.

Fredericton, N. B.—Bids for building the McKnight's bridge are wanted by the Department of Public Works.

Gibson, N. B.—See New Brunswick Roads, under Railroad Construction.

Gilbert Plains, Man.—James C. Turner, Municipal Clerk, wants bids for a bridge over the Valley River.

Godfrey, Ill.—The Chicago & Alton, according to report, will rebuild a number of bridges on the Jacksonville Branch.

Grand Forks, N. Dak.—Regarding the report that the Northern Pacific will build a steel drawbridge over Red River here, we are told that there is no authority for the report.

Hinton, W. Va.—The Hinton, New River Bridge Co. has let a contract to the American Bridge Co., in New York, for its bridge across the New River at Hinton. The bridge will be 1,200 ft. long, with 18-ft. roadway, and will be 60 ft. above low water. The contract price is $45,000.

Huntington, N. Y.—The State Board of Railroad Commissioners have decided that an undergrade crossing of the Long Island R. R. tracks may be built at the Centerport & Dix Hills Road.

Lafayette, Ind.—According to report, the Brown street bridge will be replaced with a steel structure at a cost of $25,000, by order of the County Commissioners.

Lexington, Ky.—The Louisville & Nashville, according to report, will build an overhead crossing where the railroad crosses the Maysville & Lexington turnpike.

Massillon, Ohio.—The Street Commissioners will soon want bids for repairing Muskingum street bridge.

Mount Vernon, Ill.—The Highway Commissioners want bids for a steel bridge over a creek 2½ miles north of the Toledo mill road.

New York, N. Y.—It is said that plans and specifications for the new bridge and viaduct to span Newtown Creek, and to cross the tracks of the Long Island R. R., at Vernon avenue, Long Island City, have been approved by the Bridge Department and the Corporation Council, and the contract for the entire work will probably be let in the near future. The bridge will be a Scherzer rolling liftbridge, and, with approaches, will be about 1,700 ft. long. The money necessary for this work has been appropriated.

Oskaloosa, Iowa.—The City Clerk tells us that there is no truth in the report that a viaduct will be built at Seventh street at the present time.

Perth Amboy, N. J.—The committee of the Middlesex County Board of Freeholders appointed to consider bridging the Raritan River, has had plans made for a bridge which will probably be about 4,300 ft. long. All of this, with the exception of about 900 ft., will be of piling on each side of a 290-ft. draw; there will be steel spans 220 ft. long each. The probable cost is $150,000.

Philadelphia, Pa.—The Committee on Highways estimates that $200,000 will be needed for general repairs to bridges. The Bureau of Surveys asks $500,000 for new bridges.

Pittsburgh, Pa.—It is announced that the time for receiving bids for the large steel bridge for the Wabash R. R., over the Monongahela River, has been extended until next week. The report that the contract for the steel had been given to the Pennsylvania Steel Co. is erroneous.

Provemont, Mich.—The Board of Supervisors of Leelanau County have granted permission to the Manitee & Northeastern R. R. to build a bridge over the narrows at Carp Lake in Provemont.

Richmond, Va.—According to report, the Richmond Passenger & Power Co., operating a line of trolley cars over the Mayos bridge, has asked permission to cease operating on the bridge until it is rebuilt or repaired.

Schenectady, N. Y.—The Schenectady Works of the American Locomotive Co. will build a new bridge across the canal at the works.

Sherbrooke, Que.—It is understood that new bids will be wanted for the steel bridge over Magog River at Wolf street.

Waterloo, Iowa.—The citizens have voted in favor of the proposition to appropriate $25,000 for building a concrete or steel bridge over Cedar River at Fourth street. The Board of Surveyors of Blackhawk County have the matter in hand. J. B. Marsh, of Des Moines, is the Engineer.

Victoria, B. C.—Bids are wanted, until Nov. 11, for a steel bridge 600 ft. long and 24 ft. wide. Information can be had of C. H. Topp, City Engineer.

Warrensburg, Mo.—Wm. H. Burfold, Road and Bridge Commissioner, informs us that he will let contracts at 2 p.m., Nov. 8, for 21 steel bridges varying in length from 16 to 45 ft.

Winchester, Ont.—The Winchester Township Council has instructed the reeve to get estimates for a bridge across Nation River.

Windom, Mo.—We are told that bids will soon be wanted by the Manchester, Des Peres & Kirkwood R. R. Address John M. Berry.

Other Structures.

Baltimore, Md.—The Hazard Wharf Co., recently incorporated, will build extensive docks at Lazaretto Point, where the company has a water frontage of 1,200 ft.

Bristol, R. I.—Plans are being made, according to report, for a new union station on India street to be used by the New York, New Haven & Hartford and the Union (street) R. R.

Carnegie, Pa.—The Jupiter Steel & Coal Co. is building a brick and steel plant near Carnegie, on the line of the P., C., C. & St. L., and the P., C. & Y., which is 120 ft. wide x 400 ft. long. The company will make steel castings from scrap. W. J. Wilson, Hamilton Bldg., Pittsburgh, Pa., is the Engineer.

Council Bluffs, Iowa.—The Chicago Great Western will build a new freight house and establish a yard on the south side of North avenue, from Seventh to Tenth streets.

Duluth, Minn.—The Duluth & Iron Range R. R. has under consideration plans for the improving of ore dock No. 4 at Two Harbors. The height of the dock will be increased, thus increasing the dock's capacity and requiring the regrading of the tracks leading to the docks. The entire cost will be about $160,000.

Harrington, Wash.—Contracts have been let by the Great Northern for four large grain warehouses, which will have an aggregate capacity of 600,000 bushels. These warehouses will be located at Harrington, Lamona, Edwall and Mohler in Washington. The contract for the lumber is one of the largest ever let in the West, exceeding 500,000 ft.

Kansas City, Mo.—According to local reports, the Missouri Pacific will soon build a new passenger station in Kansas City.

Los Angeles, Cal.—The Los Angeles (street) Ry. will build new shops near its present plant in this city. The new shops will cover 10 acres.

Mason, Mich.—The Michigan Central will build a passenger station in this city near their freight depot. At present the depots are about two blocks apart, making it inconvenient for one agent to do the work of both departments.

New Castle, Pa.—The Hartman Manufacturing Co. will build an open-hearth steel furnace, rod and wire mills and a plant to make nails. Plans are now being made for an open-hearth plant which will consist of five 50-ton furnaces; also for a blooming mill. Arrangements will soon be made for building a modern 600-ton blast furnace to supply iron for the open-hearth department. The rod mill will have a daily output of 350 tons, and 500 kegs of nails per day will be made. The small wire plant in Ellwood City, owned by the company, will probably be removed to New Castle.

New Orleans, La.—The Illinois Central and the Yazoo & Mississippi Valley railroad have brought a petition in the Civil District Court, seeking to compel the Orleans Levee Board to grant their petition to go forward with the harbor improvements planned by the roads. The grant already has been approved by the City Council, but the concurrence of the Levee Board is essential.

Pen Argyl, Pa.—The repair shops of the Lehigh & New England R. R. Co., with three locomotives and considerable machinery, were destroyed by fire Oct. 17.

Scranton, Pa.—The Lackawanna & Wyoming Valley Rapid Transit Co. has bought 96 acres of the land vacated by the Lackawanna Iron & Steel Co., and will build passenger and freight depots, shops and power plant. It is also said that the Westinghouse people will establish a plant here, as they are interested in the electric railroad.

Washington, N. J.—According to report, the Empire Steel & Iron Co. will spend about $1,000,000 in improving the property of the Oxford furnace and in building a steel plant. Leonard Peckitt is President.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

Eastern Association of Car Service Officers.

The next meeting of this Association will be held at 24 Park Place, New York City, Nov. 7.

Canadian Society of Civil Engineers.

At the ordinary meeting, Thursday, Oct. 24, at 8 p.m., a paper was read by Mr. W. W. Colpitts on "Economics of Railway Improvements."

Railroad Telegraphers.

The annual meeting of the Order of Railroad Telegraphers was held at St. Louis, Oct. 19.—The President for the ensuing year is H. B. Perham, of St. Louis; Secretary, L. W. Quick, St. Louis.

Pacific Coast Railway Club.

At the regular meeting, held in San Francisco on Sept. 21, Mr. P. H. Dudley presented a paper on "Rail Sections and Comparative Results Obtained on Light and Heavy Steel Rails in a Permanent Way."

Northwest Railway Club.

At the meeting held in St. Paul, on Sept. 10, the papers presented were, "The Roundhouse Force, Its Organization and How to Increase Its Efficiency," by S. N. Woodruff, Master Mechanic, Soo Line; and "Telegraphy," by D. McNicol, M., St. P. & S. Ste. M. Ry.; "Pooling of Locomotives" was the subject for special discussion.

Canadian Roadmasters and the Track Supply Association.

The annual meeting of the Canadian Roadmasters' Association, which was to be held at Hamilton, Ont., Oct. 16, having been indefinitely postponed, the meeting of the Track Supply Association has also been postponed. The following officers of the Track Supply Association will remain in office until the next meeting: President, F. E. Came, Montreal; First Vice-President, R. J. Davidson, Hillburn, N. Y.; Second Vice-President, A. O. Norton, Coaticook, Que.; Honorable Secretary-Treasurer, Acton Burrows, 33 Melinda street, Toronto.

The Railway Club of Pittsburgh.

On the 18th the organization was made of the Railway Club of Pittsburgh. Fifty names were enrolled, and it is expected that at least 100 will be secured before the next meeting, which will take place in about a month. The meeting to organize this club was called by Mr. J. H. McConnell, General Manager of the Pittsburgh Works of the American Locomotive Company (recently of the Union Pacific); Mr. D. F. Crawford, Superintendent of Motive Power Pennsylvania Lines, Northwest System; L. H. Turner, Superintendent of Motive Power, Pittsburgh & Lake Erie, and J. D. McIlwain, President of J. D. McIlwain & Co., railroad supplies. Mr. McConnell was chosen temporary chairman and Mr. J. D. Conway, of the Motive Power Department of the Pittsburgh & Lake Erie, Secretary. Mr. Turner was elected President, but declined to serve and nominated Mr. McConnell, who was elected, and Mr. Turner was elected Vice-President. In the permanent organization Mr. Conway

was elected Secretary and Mr. McIlwain Treasurer. The Executive Committee is composed of D. F. Crawford, Chairman; J. E. Simons, Superintendent of Rolling Stock, Pittsburgh Coal Company, and F. T. Hyndman, Master Mechanic, Pittsburgh & Western.

General Passenger Agents.

The American Association of General Passenger and Ticket Agents held its annual meeting at Asheville, N. C., Oct. 15, 16 and 17. Action was taken looking to the continuance of the most vigorous possible efforts for the prosecution of illegal and fraudulent ticket brokerage, and the chairmen of the several traffic associations were appointed a permanent committee on the subject. The report of the committee, showing what progress has been made in fighting the scalpers during the past year, is given in another column.

Mr. John Francis, of the Burlington & Missouri River, delivered the annual oration. The Committee on Safety Paper reported that every prominent line in the country except one is now using it for interline tickets. Assurances were received that many of the small lines will do so by January. Secretary Smith reported that safety paper is used on rail and water lines with total mileage of 176,418 miles, leaving but a small percentage of lines not using the paper, but the use by some of the small roads of other paper for interline tickets largely nullifies the value of safety paper. A resolution was adopted extending to Jan. 1, 1903, the time in which safety paper is to be compulsory. The organization of a protective bureau was approved. It is to have a chairman who will be authorized to employ the services of a detective agency. The convention decided upon the establishment of a department which will provide for life insurance. Membership is to be voluntary.

The President of the Association for the ensuing year is Mr. J. R. Wood, of the Pennsylvania. The next meeting will be held at Portland, Me.

PERSONAL.

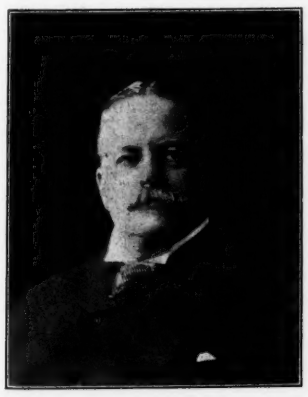
(For other personal mention see Elections and Appointments.)

—Mr. D. F. Holman was killed in Chicago last week, having been struck by an elevated train. Mr. Holman, who was 70 years old, is known as the inventor of the Holman railroad track layer, which has been considerably used, and he had recently secured contracts for three new machines. He has been connected with various railroad supply houses.

—Mr. Luther J. Parks, General Passenger Agent of the Southern Pacific Company (Atlantic System), died Oct. 16, at Liberty, N. Y. He was born at New Orleans, La., July 19, 1860, and began railroad work as a telegraph operator on Morgan's Louisiana & Texas Railway in 1882. Three years later he entered the service of the Southern Pacific Company as a clerk and continued with this company up to the time of his death. From clerk he became Superintendent of Telegraph; chief clerk to the General Superintendent; Assistant General Passenger Agent, and, in December, 1899, was promoted to the position of General Passenger Agent.

—Mr. William Rodgers, the founder of the sheet tin Russian and blue and planished iron industry in the United States, died in Wheeling, W. Va., Oct. 7. He was born in Wolverhampton, England, in 1827, and came to America when he was about 30. In 1857 he built the Everson and Preston works, the first sheet mills in Pittsburgh. In 1863 he put two sheet mills in the old nail plant at Apollo, Pa. Here he made the first black plate for tinning. In 1870 he built two mills at Leechburg, Pa., making tin and sheet iron and tin plate under the firm name of Rodgers & Burchfield. In 1871 he accepted a commission from the Governor of Pennsylvania, to make a mineralogical research of Great Britain and Continental Europe. He was a pioneer in the use of natural gas for iron making, for which he had patents, but lost them in the litigation following the failure of Rodgers & Burchfield.

—Mr. Julius Kruttschnitt was recently appointed Assistant to the President of the Southern Pacific Company "with such powers and duties in addition to those pertaining to his present office of Fourth Vice-President and General Manager as may be prescribed from time to time. All officers heretofore reporting to the President will hereafter report to him." This naturally implies carrying on most of the duties of the President's office, except such as are transacted in great financial centers. Mr. Kruttschnitt has been well known to our readers for some years as having an unusually active and broad interest in what we may call the professional side of railroading. He has done a great deal to ascertain the methods by which economies may be secured in administration and operation and has made many special studies along lines on which the information of general managers is often more or less superficial and second hand. Doubtless this has come partly from the fact of his being a civil engineer by profession and thus having the habits and training of that profession. He was born in New Orleans July 30, 1854, his father having been the German Consul at that port. He was graduated as a civil engineer at the Washington and Lee University, Virginia, in 1873. Five years later he was in charge of the extension of the Morgan road from Morgan City westward, carrying the road as far west as Cheneyville. He became Roadmaster of the Western Division of that road, then Assistant Chief Engineer and General Roadmaster, and in 1883 he became Chief Engineer and Superintendent of the System. Oct. 1, 1885, he was made Assistant Manager of the Atlantic System of the Southern Pacific Company, and Oct. 1, 1889, he became General Manager of the Atlantic System, Vice-President of the Galveston, Harrisburg & San Antonio and the Texas & New Orleans, and President of the New York, Texas & Mexican, the Gulf, Western Texas & Pacific and the Sabine and East Texas railroads. On Oct. 1, 1895, he became Fourth Vice-President and General Manager of the Southern Pacific Lines.



As will be judged from his portrait, he has a vigorous physique to support his energetic mind, and we may well expect for him a long career of usefulness.

—Mr. J. H. Olhausen, General Superintendent of the Central Railroad of New Jersey, who was recently granted leave of absence, and who has just returned from Hot Springs, Ark., where he has been for several weeks in search of health, has resigned after 46 years of active railroad service. He is suffering severely from sciatic rheumatism, which appears to be growing worse instead of better and he has for some time been unable to walk. Mr. Olhausen began as a machinist, when 17 years of age, in the shops of the Philadelphia & Reading, at Pottstown, Pa., near which town he was born and raised. After working in the shops for nearly three years he assisted in laying out and building a number of coal branches which this company was opening at that time. He also helped in building the Mahanoy & Broad Mountain Railroad, and after the road was completed and ready for operation he was made despatcher, as a trainmaster was then called. This was in 1861. Nine years later he was appointed Superintendent of the Mahanoy Division of the Philadelphia & Reading, and, with added territory, retained this position until 1886, when he became Superintendent of the main line at Reading, Pa. During the time Mr. Olhausen was in charge of the Mahanoy Division the "Molly Maguire" troubles occurred, which naturally made the position a very trying one. He took the position he now resigns on Jan. 1, 1887. The efficiency and discipline of the Central of New Jersey trainmen have long been recognized as of the best, and in Mr. Olhausen's 13 years of service he has made a solid reputation as an operating officer. Mr. Olhausen is 63 years old, having been born April 11, 1838.

ELECTIONS AND APPOINTMENTS.

Ashland & Wooster.—A. S. Miller has been appointed General Manager, with headquarters at Ashland, Ohio.

Baltimore & Ohio.—J. F. Irwin has been appointed Superintendent of the Connellsville Division, succeeding J. H. Glover, resigned, effective Oct. 10.

Buffalo & Susquehanna.—F. A. Lehr has been appointed Acting Auditor.

Burlington & Missouri River in Nebraska.—A. B. Smith, Assistant General Passenger Agent, has resigned, and not A. B. Smith, First Assistant General Freight Agent, as incorrectly stated in our issue of Oct. 11.

Central of New Jersey.—W. W. Wentz, Jr., who has been Acting General Superintendent, was, on Oct. 15, appointed General Superintendent, succeeding J. H. Olhausen, retired. The office of Assistant Superintendent of the New Jersey Central Division, formerly held by Mr. Morse, has been abolished.

Chicago & Eastern Illinois.—H. H. Rhodes, heretofore Assistant General Freight Agent, has been appointed Coal Traffic Manager, with headquarters at Chicago, Ill.

Chicago & North Western.—The duties formerly discharged by T. A. Lawson, Division Superintendent, at Chicago, have been divided, W. H. Whalen, with headquarters at Oshkosh, Wis., having assumed part of them.

Chicago Terminal Transfer.—The following new Directors have been elected: E. S. Layman, J. Cooper, H. W. DeForest, O. T. Bannard, C. W. Gould, M. Tierney and F. G. Reighley.

Colorado Springs & Cripple Creek District.—L. F. Linney has been appointed Auditor, relieving E. F. Draper, Secretary and Assistant Treasurer, to this extent.

Denver & Rio Grande.—C. G. Warner and Russell Harding have been elected Directors, succeeding J. E. Simmons and R. T. Wilson.

Evansville & Terre Haute.—At a meeting of the Directors, held Oct. 21, E. R. Thomas was elected President, E. S. Hooley, Vice-President, and G. S. Wright, Secretary and Treasurer.

Galveston, Houston & Northern.—E. H. Harriman has been elected President.

Great Northern.—D. McLaren has been appointed Superintendent of the Dakota Division, with headquarters at Larimore, N. Dak., succeeding F. G. Williamson, resigned, effective Oct. 21.

Indiana, Illinois & Iowa.—Frank R. Hale, heretofore Trainmaster, has been appointed Superintendent, with headquarters at Kankakee, Ill., effective Oct. 15.

Kansas City Belt.—G. T. Neubert has been appointed Master Mechanic, succeeding M. J. Rogers, resigned, effective Oct. 10.

Maine Central.—T. W. Symonds has been elected a Director, succeeding the late J. S. Ricker.

Mexican.—E. Muller has been appointed Assistant General Freight and Passenger Agent, succeeding D. W. Harvey.

Miller County.—The officers of this company are: President, F. M. Pease; Vice-President, W. W. Taberner, Chicago, Ill.; and George H. Monohan, of Aurora Springs, Mo., Assistant Secretary.

Monterey & Mexican Gulf.—The officers of this company are: President, V. Stoclet; Vice-President, A. Fresez, Brussels, Belgium; General Manager, A. Monnom; General Superintendent, L. Mathieu; Superintendent Traffic and Transportation, G. W. West; Auditor, John Ashley; Superintendent of Motive Power, F. L. Blaricum.

New York, New Haven & Hartford.—M. E. Milner has been elected a Director.

St. Joseph & Grand Island.—At a meeting held recently, Raymond DuPuy, General Manager, was elected a Director.

Southern Pacific.—G. A. Parkyns, heretofore Assistant General Freight Agent at San Francisco, Cal. (Pacific System), has been transferred to Los Angeles, Cal., as Assistant General Passenger and Freight Agent, succeeding G. W. Luce, promoted to succeed Mr. Sheppard as General Freight Agent. T. A. Graham succeeds Mr. Parkyns.

Tennessee Central.—P. W. Early has been appointed Division Engineer, with headquarters at Lebanon, Tenn.; Stanley Millard, Resident Engineer at Nashville, and J. H. Collins, Division Engineer at Clarksville, Tenn.

The Pullman Co.—George F. Brown, heretofore General Manager, has been appointed General Manager of the Manufacturing Department; C. A. Garcelon, heretofore General Superintendent, becomes General Manager of the Operating Department; W. H. Reed, heretofore Superintendent of the Chicago Division, succeeds Mr. Garcelon as General Superintendent. The present general operating divisions, Chicago, Atlantic, New York, Eastern St. Louis and Pacific, have been abolished and four divisions created, with appointments as follows: Northwestern Division, C. R. Wager, Superintendent, at Chicago; Northeastern Division, J. S. Merrill, Superintendent, at New York; Southeastern Division, James Martin, Superintendent, at Philadelphia; and Southwestern Division, D. H. Martyn, Superintendent, at St. Louis; effective Nov. 1.

Wellington & Powellsville.—J. L. Bell has been appointed General Freight and Passenger Agent, succeeding M. C. Hinshaw, resigned.

Wheeling & Lake Erie.—A Pittsburgh despatch states that official announcement has been made of the appointment of J. E. Taussig, heretofore Assistant to the General Manager and Superintendent of Telegraph, as Superintendent, with headquarters at Canton, Ohio, and that the office formerly held by Mr. Taussig has been abolished.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA ROADS.—It is said that the Clear Creek Lumber Co., of Birmingham, will build a standard gage road about six miles long to connect its timber lands with the Louisville & Nashville. W. G. Robinson, Birmingham, Ala., is President.

ARKANSAS, MISSOURI & KANSAS.—The final surveys of this line, which was incorporated in Missouri last July, to build from the south State line in Stone County to the west State line in Jasper County, have been completed. The terminals of the line, as surveyed, will be Joplin and Granby, Mo., and a district rich in minerals and timber will be opened up. (Construction Supplement, Oct. 11, 1901.)

BAINBRIDGE NORTHERN.—An officer writes that the four-mile extension of this line to reach the property of the Flint River Lumber Co., near West Bainbridge, Ga., is completed and that trains will begin running within 10 days.

BALTIMORE & OHIO.—It is reported that the Tylerdale Belt Line is to be extended five miles from its present terminus at Tylerdale, Pa., to McConnells mills. Two routes have been surveyed for the proposed extension and a favorable grade has been found.

BARTOW & PLANT CITY.—This company is said to have been reorganized by the election of new officers, and it is understood that a railroad is to be built between the two towns named, 20 miles long. Clarence A. Boswell is President, and E. C. Stuart, General Manager.

CALGARY & EDMONTON.—This company is to apply for another charter at the next session of the Dominion Parliament. The line now proposed is to begin at a junction with the Calgary & Edmonton line at a point near Hobbema, N. W. T., and proceed in an easterly direction towards the South Saskatchewan River and thence to Yorkton, N. W. T. The air-line distance between these is nearly 500 miles.

CALIFORNIA MIDLAND.—Incorporations have been filed in California for a railroad to run from San Francisco to a point near the mouth of Kings Creek, a branch of the San Joaquin. The distance between these points is 200 miles, and a branch is also to be built from a point on the main line near Madera, to Bakersfield, 115 miles; also a branch into the Yosemite Valley, 70 miles long, and a branch to Stockton, 20 miles. The total trackage is to be nearly 500 miles. The capital stock is $15,000,000, and the incorporators are: W. H. H. Hart, W. M. Graham, Daniel E. Hayes, R. J. Davis, E. R. Graham, Edward Dexter, Albert Betz, Henry C. Bunker and B. C. Van Emon.

CHICAGO & LAKE SUPERIOR.—It is said that this line, which extends from London Station, on the Chicago & North Western, three miles south to Cambridge, Wis., will extend its tracks five miles southwest to Rockdale some time this fall or next spring. The road already has considerable distance graded beyond the three miles, which are at present in operation, and was originally projected from Chicago to Superior.

CHICAGO & NORTH WESTERN.—It is said that this company will start at once building a line from Union Center, Wis., on the main line, eight miles to Hillsboro.

COLORADO ROADS (ELECTRIC).—Rights of way are reported secured for an electric line from Billy Creek to the town of Ouray, Colo., 20 miles distant. There are coal mines at Billy Creek and the road is to carry coal as well as passengers. The Denver & Rio Grande has a line in operation between these points.

DOTHAN, HARTFORD & FLORIDA.—Work is reported begun on a new railroad from Dothan, Ala., to St. Joseph, Fla. The proposed route is 102 miles long and runs through Henry and Geneva counties in Alabama, and Jackson, Washington and Liberty counties, Fla. It will connect at Chipley, Fla., with the Louisville & Nashville.

EL PASO, PHOENIX & CALIFORNIA SOUTHERN.—This is the correct name of the company referred to Oct. 11 (p. 712) as the El Paso, Phoenix & Southern. Incorporation took place in Arizona on Aug. 31, and the route indicated is from Benson, in Cochise County, to Phoenix and thence to Yuma, Ariz., a total of 500 miles. The incorporators are the following: M. H. McCord, J. L. B. Alexander, John A. Kurtz, Phoenix; J. J. Hodnett, M. E. Currey, Tempe.

ESCANABA & LAKE SUPERIOR.—An officer writes in

regard to the proposed extension 15 miles north from Northland, Mich., that the surveys are completed and grading done. Rails and rolling stock have already been bought and delivered and it will not be necessary to issue new securities to meet the expenses of building. (Oct. 11, p. 712.)

Georgia Roads.—The greater part of the grading on the line between Douglas and the Ocmulgee River is reported done as far as Braxton, and it is thought that work will soon be begun on the other end of the road leading towards Valdosta. (Aug. 23, p. 696.)

The contract for grading what is known as the Perkins R. R. from the Canoochee River to Register, Ga., 9½ miles, has been let to B. Harden, and it is thought that the work will be completed within two months.

Great Northern.—A large tract of land in the east end of Vancouver, B. C., is reported to have been purchased by this company. In a few weeks work is to be commenced on the extension of the Great Northern into that city.

Illinois Central.—The line, 42 miles long, between Rosedale and Davis, Miss., was in operation Oct. 21. The branch is known as the Kimball Lake District on the Vicksburg Division, and reaches a rich cotton section.

Kansas City, Mexico & Orient.—It is reported that more than 200 miles of this line in Kansas and Mexico have been graded, and that the greater part of it will be in operation by the first of next year. In Texas 25 miles have been graded south of the Red River. It is thought that trains will be running over the 68-mile stretch between Port Stilwell, Mexico, and Fuerte by the 1st of November.

Kansas City & Olathe (Electric).—Incorporation has been granted by the State Charter Board for a new electric railroad from Kansas City to Olathe, Kan., passing through Rosedale, Shawnee and other towns. The proposed distance is 22 miles southwest, and the capital $1,000,000. The line parallels the Kansas City, Fort Scott & Memphis.

Kootenay Ry. & Navigation.—It is thought that the extension from Arrowhead to Lardeau, B. C., on the northern shore of the Upper Arrow Lake, 30 miles, will be completed this year.

Manistee & Northeastern.—The Board of Supervisors of Leelanau County, Mich., have granted a permit to this company to build a bridge over the narrows of Carp Lake at Provement, in connection with the proposed extension of their line from Solon north to Northport, about 30 miles. It is said that this extension will undoubtedly be built next spring. (See under Michigan Roads, Sept. 27, p. 676.)

Missouri Pacific.—It is said that the new river valley line from southeastern Arkansas into Louisiana will be begun as soon as contracts for the work can be placed on both the part from Trippe, Ark., south to a connection with the New Orleans & Northwestern, near Vidalia, La., and from Trippe northeast to a connection with the Helena, Ark., branch of the Iron Mountain.

Missouri Roads (Electric).—Directors have been elected for a new electric line 14 miles long, to run from Ava, in Douglas County, Mo., to Cedar Gap, Wright County, on the Memphis Division of the St. Louis & San Francisco. The estimated cost of the line is $50,000, and the following officers have been elected: President, W. J. Turner; Vice-President, J. H. Murray; Treasurer, J. A. G. Reynolds; Secretary, H. S. Wilson; Auditor, A. H. Buchanan.

Monongahela River & Cassville.—A number of condemnation proceedings have been begun in the Circuit Court of West Virginia, preparatory to building this projected road through coal fields from Morgantown, W. Va., on the Baltimore & Ohio. It is said that work will be begun as soon as right of way can be condemned. (Construction Supplement, Oct. 11, 1901.)

Mount Rogers & Eastern.—The articles of incorporation of this company specify that the capital stock shall be $750,000, and that the company may build a railroad beginning at a point near Independence, Grayson County, Va., to run in a westerly direction to a point on the Tennessee, North Carolina or Kentucky line, as may be found most advantageous; also from a point at or near Independence, running easterly by the most feasible route to some point on tidewater in the State of Virginia, with branches. The incorporators are as follows: A. A. Campbell, L. A. Sebastian, S. C. Plummer, R. L. Greear, H. A. Hoffman, I. B. Bryant, J. G. Davis, J. D. Perkins, L. Phipps, A. E. Parson and W. C. Bagwell. (Oct. 11, p. 712.)

New Brunswick Roads.—The contract for the proposed railroad from Chipman to Gibson, N. B., is being sublet in short sections by James Barnes, M. P. P., the contractor. There is also to be a steel bridge near Gibson, N. B. (March 15, p. 194.)

New York Central & Hudson River.—It is said that this company will double the capacity of its present freight yards at Syracuse, N. Y. The plans for the proposed enlargement include additional switches and tracks on land recently purchased by the company, and enlargement of the freight house, the length of which is to be increased 400 ft.

Norfolk & Western.—Contract is said to have been let for 25 miles of additional road in the North Carolina Division, from a point near the new cotton mills at Fries, in Grayson County, towards the Virginia and North Carolina State line.

Ontario Roads.—A new railroad between Port Rowan and Collingwood, Ont., is being projected by John Charlton, M. P. P., for Collingwood.

Orange County Traction.—This company was incorporated at Albany, N. Y., Oct. 16, with a capital of $325,000, as a reorganization of the Newburg Electric Ry. Co. The directors are: F. H. Moffatt, of New Brighton; F. H. Pouch, L. H. Clark and B. J. Bloodgood, of Brooklyn, and others.

Oregon Roads.—Arrangements are said to be completed for building a railroad from Cottage Grove, Ore., to the Bohemia mines, 35 miles distant. The Helena and Musick mining companies are behind the project.

Ozark & Cherokee Central.—Contract for the extension of this company's lines from Tahlequah, Ind. T., to Muscogee and Shawnee, Okla. T., has been let to the Kenefick Construction Co. (Sept. 6, p. 628.)

Paducah & Cairo.—This company was organized in Kentucky, Oct. 12, with a capital stock of $700,000, to build from Paducah, Ky., 28 miles in a westerly direction to Wyckliffe near the State line. At Wyckliffe connection is to be made to Cairo, Mo., over the tracks of the Illinois Central.

Potomac & Pocahontas.—Surveys are reported for new railroad to traverse the upper Potomac through Mineral, Grant, Hardy and Pendleton counties, West Virginia. It is said that the U. S. Leather Co. is financing the road, which will pass its New Creek and Petersburg tanneries.

Rapid Railway (Electric).—This company, which is part of the Detroit, Port Huron & Shore Line, and operates 17 miles of electric line in Michigan, has submitted for the approval of the Board of Railroad Crossings maps showing the location of a proposed extension of its line from Anchorville, Mich., to Marine City, 10 miles. The company owning that portion which covers the proposed extension is organized under the general railroad laws of the State.

Santa Fe Central.—This company has awarded the contract for this new line from Santa Fe, N. Mex., to Chameleon Springs, in Lincoln County, to the Pennsylvania Development Co. The road is to be built by way of San Pedro and Pinos Wells, and will be 116 miles long. There will be one bridge of importance over the Galisteo River at a point where excellent rock bottom has been found. (Oct. 11, p. 762.)

Sault Ste. Marie Terminal.—Incorporation has been made in Michigan under the Union Depot Act, for a company with a capital stock of $100,000, to build a depot with terminal facilities in Sault Ste. Marie. The project includes spur tracks to connect the depot with all the railroads in the city and with the factories on the power canal of the Lake Superior Power Co. The Directors are: Francis H. Clergue, Casper W. Worthington, H. von Schon, John H. More and James E. Whalen, all of Sault Ste. Marie.

South Georgia.—This company is reported as having 10 miles graded south from Greenville, Fla., on the Seaboard Air Line, and it announces that it intends to continue its line as far as Tampa. The extension south 22 miles from Quitman, Ga., to Greenville, Fla., was officially reported to be opened on Oct. 1. (Sept. 20, p. 660.)

Syracuse & Suburban (Electric).—Notice has been filed with the County Clerk at Syracuse, N. Y., of this company's intention to extend their line 33 miles on four branches: From Orville to Jamesville; from a point near Oran along the main highway to Delphi; from Edward Falls to Cazenovia, and from Fayetteville to Oneida. The last-named extension is an important link in the line to unite Syracuse and Utica. The line to Jamesville is to be built first.

Tacoma Southern Ry. & Navigation.—An officer writes that this company has bought the grade and deep water terminals at Tacoma and Steilacoom, together with other valuable properties formerly owned by the Tacoma and Columbia River and the American Lake railroads. No further information is at present available except that contracts have already been given for part of the work. (Construction Supplement, Oct. 11, 1901.)

Texas & Pacific.—An officer writes that surveys have been made to shorten the line between Texarkana and Sulphur, Texas, which is 12 miles distant, on the line between Texarkana and Jefferson. No decision in regard to building has yet been made. The line at present runs around two sides of the triangle between the points named.

Union Pacific.—The Aspen tunnel on the Leroy-Bear River cut-off of this company was completed Oct. 8, and trains are now running over the new route. The cut-off and tunnel shorten the line almost 10 miles and reduces the grade over that portion from 70 to 43 ft. to the mile. Two years have been spent on the work, which is said to have cost over $3,000,000. (Aug. 30, p. 612.)

Warrior Southern.—Incorporation of this road in the interest of the Mobile & Ohio has been made in Alabama. The line is to run from the extension of the Mobile & Ohio at Searcy, near Tuscaloosa, Ala., 38 miles northeast to Ensley, just outside of Birmingham. The full amount of the stock has been subscribed by officers of the Southern and the capital is $300,000. The officers are: President, A. B. Andrews; Vice-President, W. W. Finley; Secretary, H. W. Miller; Treasurer, H. C. Ansley; Auditor, A. H. Plant.

Waycross Air Line.—This company is said to have under consideration an extension of its line from Cordele into Dooly County, 27 miles northwest, to Montezuma, in Macon County, Ga., and perhaps on as far as Birmingham, Ala.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—On Feb. 1, 1902, this company will discontinue its San Diego Steamship Line and use jointly with the Southern Pacific the Pacific Mail Steamship Co., in its trans-Pacific business.

At the annual meeting of the stockholders, Dec. 12, the following propositions will be made: To approve the purchase of the Kansas City, Emporia & Southern; the Florence, Eldorado & Walnut Valley; the Marion & McPherson; the Wichita & South Western, and the Chicago, Kansas & Western railroads. This action does not involve the creation of new obligations but it is in accordance with the policy of the company in consolidating and unifying the system and its bookkeeping by vesting in the company, as far as practicable, the legal title to the various lines embraced.

Also to approve the purchase of the capital stock and bonds of the Pecos Valley & Northeastern and the capital stock and second mortgage bonds of the Santa Fe, Prescott & Phoenix R. R. The last named line runs from Ash Fork, in Arizona, to Prescott and Phoenix, Ariz., with branches which bring the aggregate length to 248 miles. The company has outstanding $4,940,000 5 per cent. first mortgage bonds, $2,964,000 5 per cent. second mortgage bonds, and $7,904,000 capital stock. Out of this the Atchison, Topeka & Santa Fe has purchased $2,963,000 of the 5 per cent. second mortgage bonds and practically all the capital stock.

California Midland.—A meeting of the stockholders of this new company is called for Dec. 20, in San Francisco, where the proposition will be considered of creating a bonded indebtedness in the sum of $7,000,000, interest to be at the rate of 5 per cent., payable in gold. The bonds are to be payable in 1951 and will be secured by a mortgage upon all the property owned or used by the said corporation, and also upon all other property in which it has any interest, with the exception of the branch of the main line from the terminus near the mouth of King's Creek to the Nevada State line, and the branch from Madera to Bakersfield, Cal.

Canadian Northern.—At the coming session of the Legislature of the Province of Manitoba the proposed mortgage of this company for $5,800,000 will be submitted. The mortgage calls for $20,000 per mile on 290 miles of the Canadian Northern System, which was formerly operated as the Manitoba Division of the Northern Pacific until sold.

Chicago, Burlington & Quincy.—It certainly seems like an *impasse* in which one side or the other must wholly give way. Both Union Pacific and Great Northern parties are after the Burlington system, now in the hands of the Northern Pacific Railway. The contention of the Union Pacific people is that if the Burlington system passes into Great Northern hands absolutely, the Union Pacific road might be ruined. The Union Pacific party has a clear majority of the Northern Pacific stock certificates; but the greater part of its control lies in preferred stock certificates, and these, the Great Northern people say, can be retired by the directors, who are understood to be in sympathy, as a board, with the Great Northern interest. Eminent legal opinion is that these preferred stock certificates are simply demand obligations which can be redeemed at par. On the other hand, the Union Pacific people maintain that the preferred certificates can only be retired by the Northern Pacific company as distinguished from the directors, and that if they are retired, the holders thereof must receive such rights and privileges in the new stock or other obligations issued in their place that their former ability to control the company through the voting power of the old certificates is unimpaired. Eminent lawyers have also written long briefs in support of this contention; and the Union Pacific claim is that the arbitration of Messrs. Vanderbilt and Cassatt, under the agreement of last May, does not extend to any question of the retirement of the preferred stock. Both sides maintain friendly relations and inform inquirers that everything is going on harmoniously. But the Great Northern people say that they will certainly retire the Northern Pacific preferred stock on Jan. 1, next, and the Union Pacific people say that they will not give up the Northern Pacific control. It can be here stated authoritatively that a proposition from the Union Pacific side that one-half of the Burlington system should be turned over to it, has been rejected by the Great Northern party and that there is not the slightest intention at present on the part of those in control of Northern Pacific common stock of doing anything with Northern Pacific preferred stock except paying it off at par and accrued interest at the time stated.—*Philip King, in New York Sun.*

Doylestown & Easton St. Ry.—This company has made a mortgage to the Girard Trust Co., of Philadelphia, trustee, to secure $825,000 of 5 per cent. gold bonds, due July, 1941. The company was organized to build an electric road 31 miles long between Doylestown and Easton, Pa., with a capital stock originally of $100,000.

Grand Rapids & Indiana.—A dividend of 1 per cent., payable Oct. 25, has been declared. This increases the dividend rate to 2 per cent. per annum, as a dividend of 1 per cent. was also declared last April.

Illinois Central.—At the annual meeting in Chicago, Oct. 16, the stockholders approved the following recommendations made to them by the Board of Directors:

That the capital stock of the Illinois Central be increased by an issue of 132,000 new shares of $100 each, raising the amount of stock from 660,000 shares to 792,000 shares, making the entire capitalization $79,200,000.

That each shareholder registered on the company's books Oct. 30 shall have the privilege, until Nov. 27, 1901, of subscribing at par for one share of the above new stock for every five shares of stock registered in his name, and for fractions of shares in like proportion, payment for the new stock to be made in full at the company's office in New York on or before Wednesday, Dec. 18, 1901.

That stockholders entitled to subscribe for fractions of shares may receive receipts convertible into full paid stock, if presented in sums of $100 or more, on or before Feb. 1, 1902, and thereafter redeemable by the company at par in cash upon presentation at the New York office.

Norfolk & Western.—At the meeting of stockholders, Oct. 10, the purchase of the Cincinnati, Portsmouth & Virginia, was ratified; also the action of the directors terminating the right to issue prior lien bonds under the first consolidated mortgage.

Pacific Roads.—A conference was held in Salt Lake on the 15th inst., by representatives of more than 25,000 miles of road. Those present were: Traffic Director J. C. Stubbs, of the Harriman System; Chicago & North Western, Vice-President H. R. McCullough, General Manager W. H. Gardner and General Passenger Agent W. B. Kniskern; Union Pacific, President H. G. Burt, General Manager Edward Dickinson, General Passenger Agent E. L. Lomax, Superintendent of Motive Power S. Higgins, and Superintendent of Transportation E. Buckingham; Oregon Short Line, Vice-President and General Manager W. H. Bancroft, General Superintendent E. E. Calvin, Traffic Manager T. M. Schumacher, General Passenger Agent D. E. Burley, and Assistant General Passenger Agent D. S. Spencer; Southern Pacific, Assistant to the President, Julius Krutschnitt and Passenger Traffic Manager E. O. McCormick; Oregon Railroad & Navigation Company, President A. L. Mohler, Traffic Manager Ben Campbell, General Passenger Agent A. L. Craig, Superintendent of Rail Lines J. P. O'Brien and Master Mechanic J. F. Graham. A few changes in time schedules and the decision to improve the equipment on all through trains seem to have been about all that was accomplished. The Southern Pacific cut-off around the south end of Salt Lake into Salt Lake City was discussed. The question of a close interchange of traffic with the Northern Pacific at Portland did not come up as reported, says good authority. The Denver gateway was discussed informally. The matter of Oriental mails was discussed, but no direct information as to the outcome could be obtained, nor could any facts be substantiated as to "how to head off the Clark movement," other than that the Short Line will continue building its road to Southern California.

Railway & Construction Improvement Co.—This New Jersey corporation has bought the Birmingham Belt Line for $500,000, in the interest, it is thought, of the St. Louis & San Francisco and the Seaboard Air Line.

South Shore.—A meeting of this Canada company has been called at Montreal, Nov. 25, to consider a proposition to issue 4 per cent. gold bonds to an amount not to exceed $3,760,000, secured by a first mortgage on all the company's property.